21 JULY 1961

METAL INDUSTRY

THE JOURNAL OF NON-FERROUS METALS

5000 extrusion dies always on tap for you

Is it extruded sections you need? In copper and copper alloys? ICI Metals Division hold dies for these and 4995 others besides.

For a vast choice of profiles and ready technical expertise, turn to ICI Metals Division.

COPPER AND COPPER ALLOY EXTRUSIONS

ICI METALS DIVISION

IMPERIAL CHEMICAL INDUSTRIES LTD. LONDON S.W.1.

C.36

VOL 99 No 3

ONE SHILLING

The Finishing Touch

N.T. FROST LTD

HARFORD ST BIRMINGHAM 19

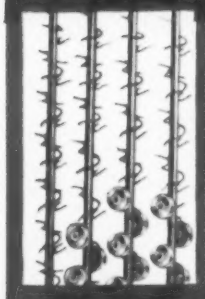
Telephone CENtral 4135 (6 lines)

experience counts...

...in jig design

CANNING bring their unrivalled experience in practical electroplating to the design and manufacture of their

insulated electro-plating JIGS



- ★ JIGS FOR ALL PROCESSES TO CUSTOMERS' REQUIREMENTS
- ★ DESIGNED FOR MAXIMUM PLATING EFFICIENCY
- ★ STAINLESS STEEL CONTACTS FOR LONG LIFE
- ★ ALL CONTACTS TRIMMED READY FOR USE

In addition to supplying new jigs an efficient repair service is operated for the speedy reconditioning of used jigs at minimum cost.

W. CANNING & CO. LTD.

BIRMINGHAM 18

TELEPHONE CENtral 8621

LONDON · SHEFFIELD
GLASGOW · BOMBAY
AND ASSOC. CO. IN AUSTRALIA

Senate House, Cambridge

The scene changes

. . . but the service is consistent

Our lorries are literally on National Service—making daily deliveries of W.M. non-ferrous ingots to every county, and almost every corner, of Britain. Non-ferrous founders know by experience that in specifying W.M. they can be sure of non-ferrous metal and alloy ingots conforming in every particular with the most exacting specifications.

for ingots of consistent reliability

Branches at: London, Birmingham, Manchester, Glasgow, Leeds, Cardiff, Newcastle-upon-Tyne

THE WOLVERHAMPTON METAL CO. LTD. HEAD OFFICE & WORKS: WEDNESFIELD, STAFFS. Tel: 31052 (7 lines)

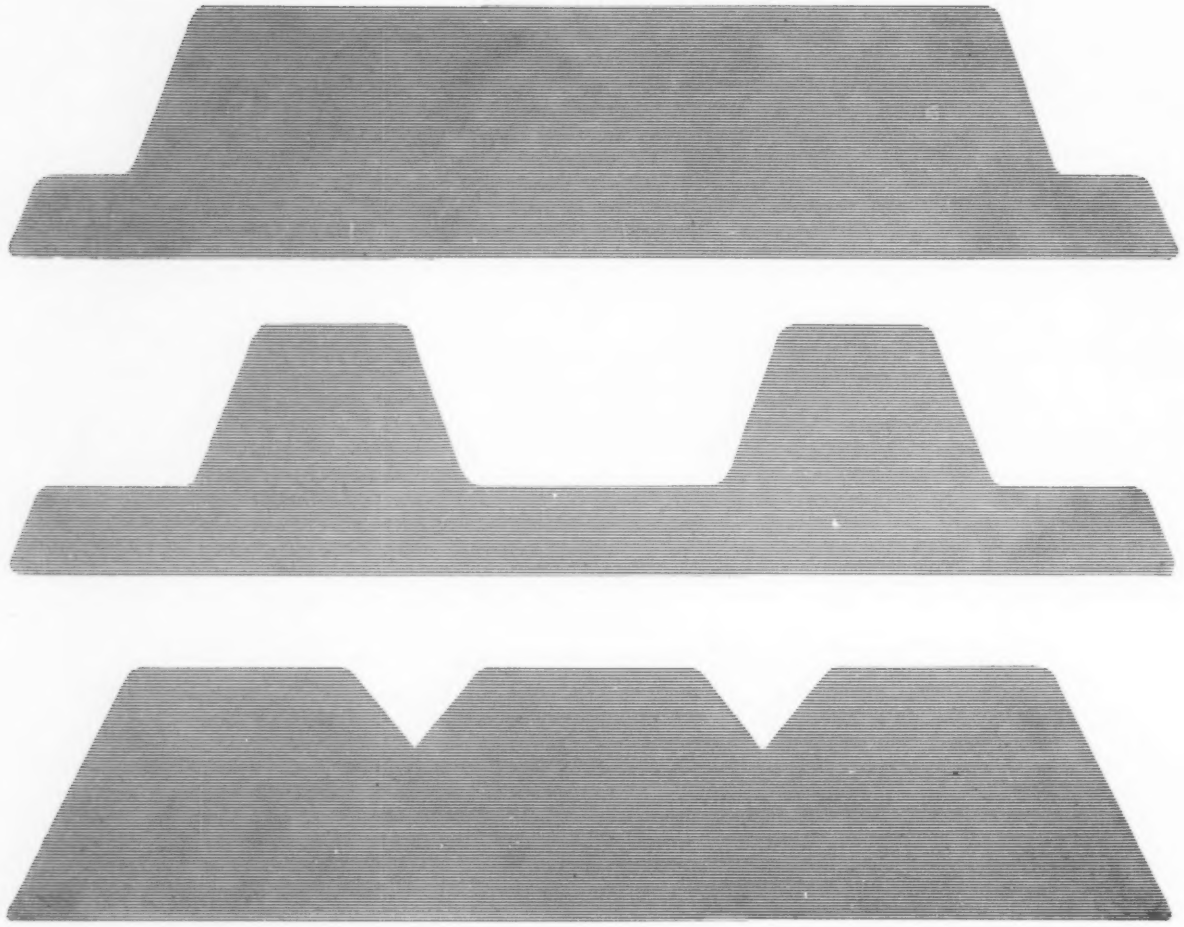
Also JAMES BRIDGE COPPER WORKS, DARLASTON ROAD, WALSALL. Tel: Walsall 6717 London Office: 64, GEORGE STREET, LONDON

A

THIS IS ALUMINIUM!

Primary aluminium
Super-Purity aluminium
Primary and secondary casting alloys

Rolling slabs
Wirebars and billets
Hardeners



BRITISH ALUMINIUM

THE BRITISH ALUMINIUM COMPANY LTD
(INGOT AND SPECIAL PRODUCTS SALES DEPARTMENT)
Norfolk House, St. James's Square, London S.W.1 | Trafalgar 8888

Britain's Largest Oldest Newest Best Aluminium Producing Company!

Write
Ring
Cable
Call
Literature
Samples
Advice
Inspiration!

A NEW brilliant finish Carrs A4000 line

A4000

Introduced by Carrs is this new "ONE-COAT" enamel, ideal for domestic appliances. With a brilliant gloss finish the A 4000 line has many advantages over existing stoving enamels. No offensive odour—even when stoving. Lower stoving temperature—giving a big saving. Greater flexibility. Excellent resistance to humidity, impact, staining and detergents.

Carr's A 4000 line gives optimum results when applied to a surface pretreated by one of their High Corrosion Resistant Pre-treatment Primers.

BEND TEST. The top photograph shows an actual specimen of Carrs A 4000 enamel subjected to a very extreme bend test.

GLOSS. The brilliant gloss of Carrs A 4000 enamel shows a 97% comparison with polished glass.

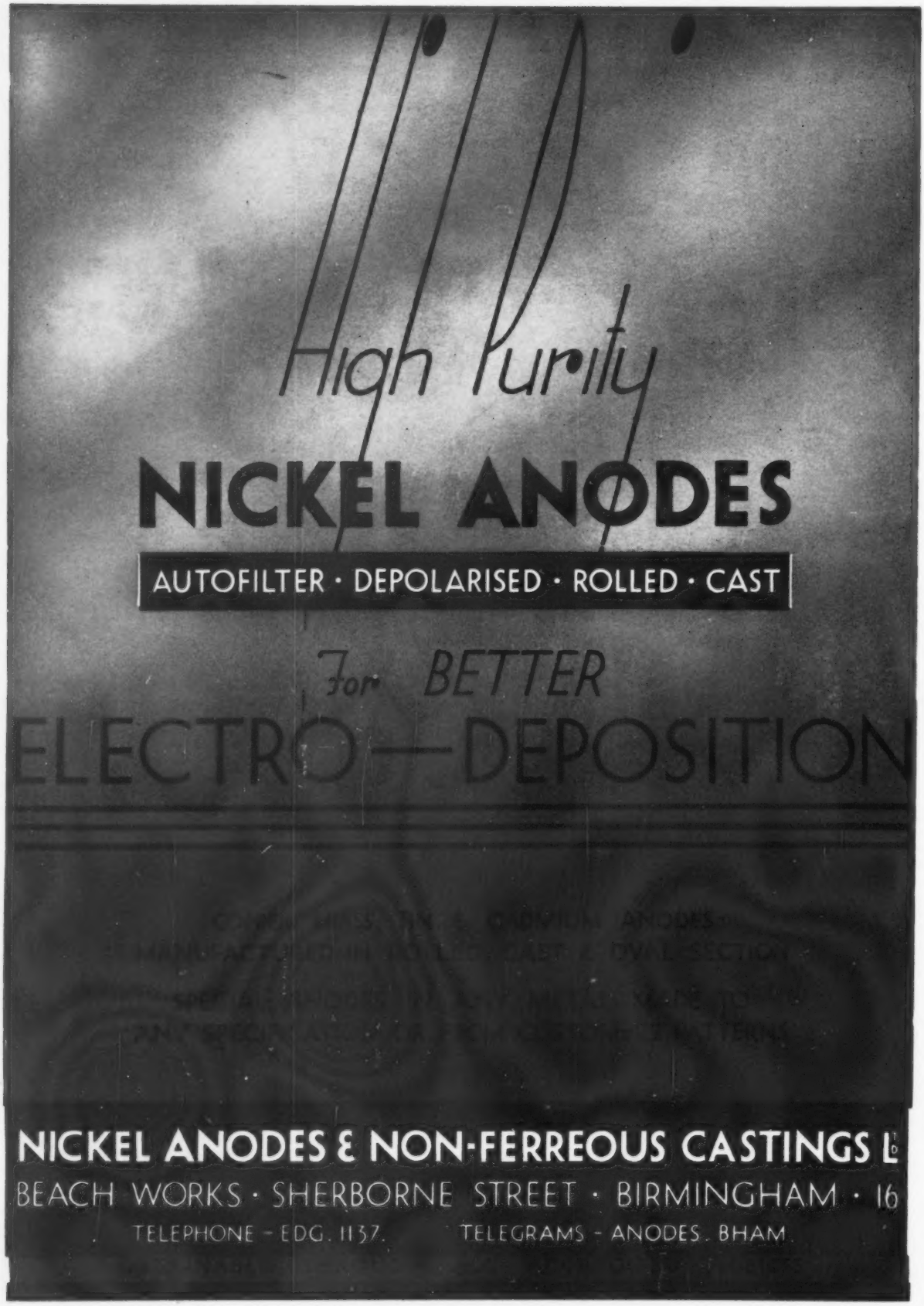
IMPACT TEST. Carrs A 4000 enamel will withstand 240 inch/lb. impaction on thin steel without flaking.

Full details of this Improved ENAMEL FINISH from:

Carrs Paints Ltd

ARTILLERY STREET WORKS,
BIRMINGHAM, 9.
'Phone VICtoria 0403.

A°


High Purity
NICKEL ANODES
AUTOFILTER · DEPOLARISED · ROLLED · CAST
for BETTER
ELECTRO—DEPOSITION
NICKEL ANODES & NON-FERREOUS CASTINGS Ltd
BEACH WORKS · SHERBORNE STREET · BIRMINGHAM · 16
TELEPHONE - EDG. 1137. TELEGRAMS - ANODES. BHAM.

ALLOYS

for the most exacting conditions

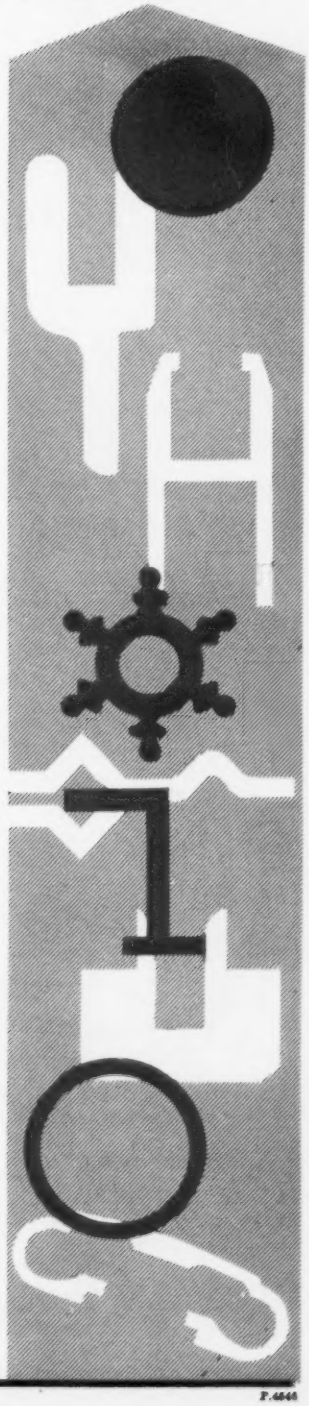
PARSONS
Manganese Bronze

IMMADIUM
High Tensile Bronze

CROTORITE
Aluminium Bronze

These three metals have been produced to withstand corrosion, high temperatures and heavy stresses. They meet the most exacting conditions in industry. Available as extruded and rolled rods, bars and tubes; rolled sheets and plates; forgings, and special extruded shapes to customers' designs.

Brasses to BS 249, BS 250, BS 251 and many other standard specifications.



The Manganese Bronze & Brass COMPANY LIMITED

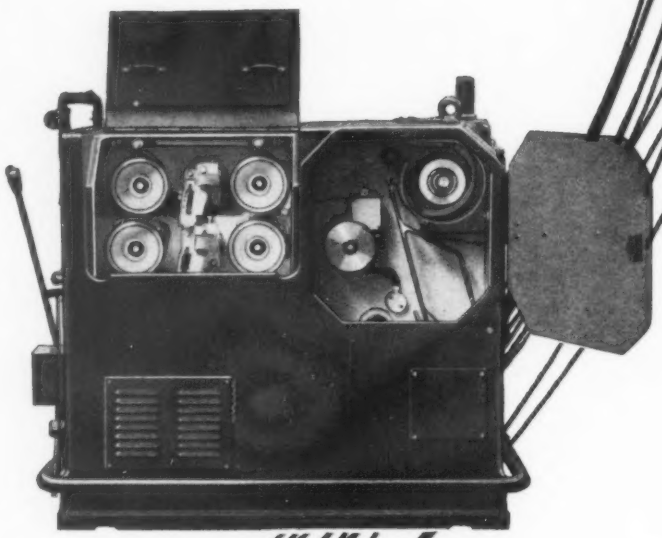
HANDFORD WORKS • HADLEIGH ROAD • IPSWICH

Telephone: Ipswich 52127 • Grams: Bronze Ipswich • Telex: 1886 Bronzeoil

P.4644

ROBERTSON

type 21 FVVJ copper wire drawing machine



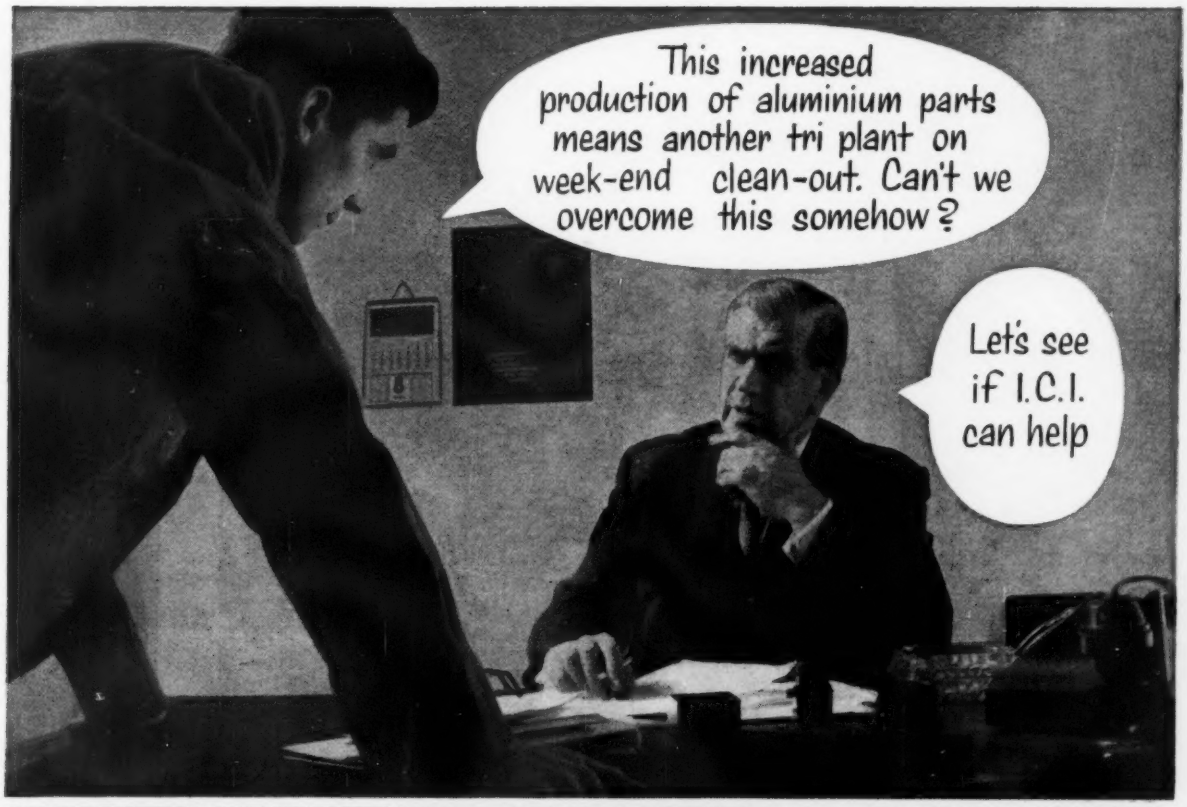
A Self-Contained 21 DIE Machine

CAPACITY: Inlet Wire 16/20 S.W.G. (1.6/0.90 mm)
Finished Sizes 36/41 S.W.G. (0.30/0.11 mm) inclusive
Speed 5,000 ft. per minute (25 metres per second)

This Robertson 21 FVVJ Copper Wire Drawing Machine is self-contained, totally enclosed and quiet in operation. All controls and adjustments are external. The 21 dies are mounted in individual sockets with two-way adjustment for alignment with the wire, and they are given a constant traversing movement to avoid wear of the drawing cones. A special method of compensation independent of the wire tension regulates the speed of the take-up spool according to the amount of wire on the spool.
The machine is started, stopped and 'inched', by a foot pedal.

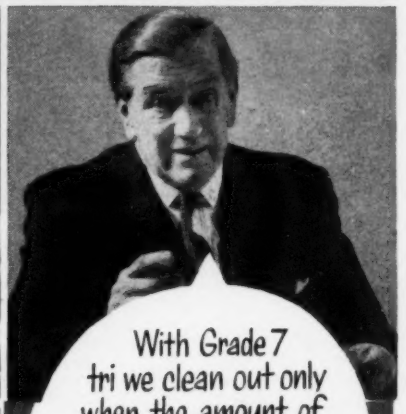
W. H. A. ROBERTSON & CO. LTD.
BEDFORD - ENGLAND

WT 306


This increased production of aluminium parts means another tri plant on week-end clean-out. Can't we overcome this somehow?
Let's see if I.C.I. can help

I.C.I.'s rep. told us about a new I.C.I. solvent — Grade 7 trichloroethylene — that gives excellent protection against aluminium reaction.

We decided to tackle our problem by putting all plants dealing with aluminium on Grade 7 tri–which would mean less frequent clean-outs.



With Grade 7 tri we clean out only when the amount of aluminium swarf makes it necessary – which gives weeks of continuous running. Ask I.C.I. for Grade 7 trichloroethylene if you are worried about degreasing aluminium.

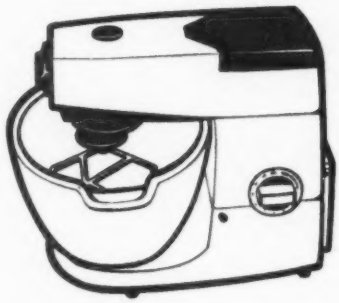
ICI GENERAL CHEMICALS DIVISION

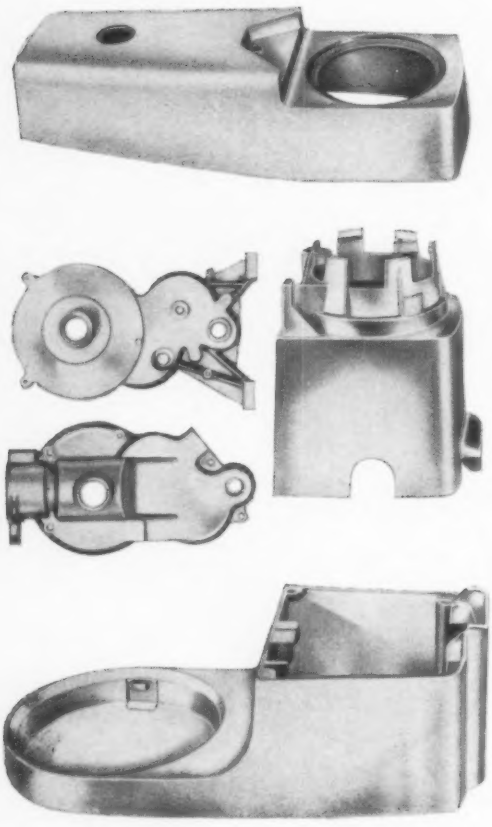
It pays to consult I.C.I. Metal Degreasing Service

IMPERIAL CHEMICAL INDUSTRIES LIMITED LONDON S.W.1

DP 267

MIXTURE AS BEFORE





Consistent quality and reliability have once again enabled us to be chosen by Kenwood to supply the Pressure Die Castings for their new Chef Mixer.

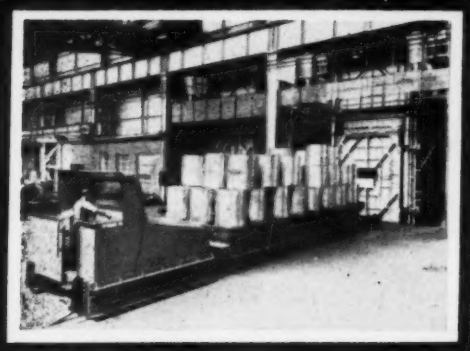
With a background of over 40 years' experience, we can genuinely claim to be true specialists in the production of large and small Pressure Die Castings in Aluminium, Zinc and Magnesium Alloys.

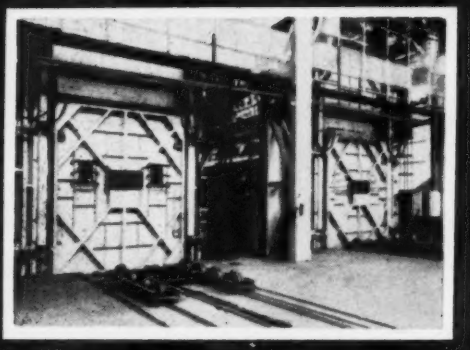
All enquiries for Pressure Die Castings will receive the most prompt attention from our technical staff, and we invite you to consult our Product Design Service on any relative problems.

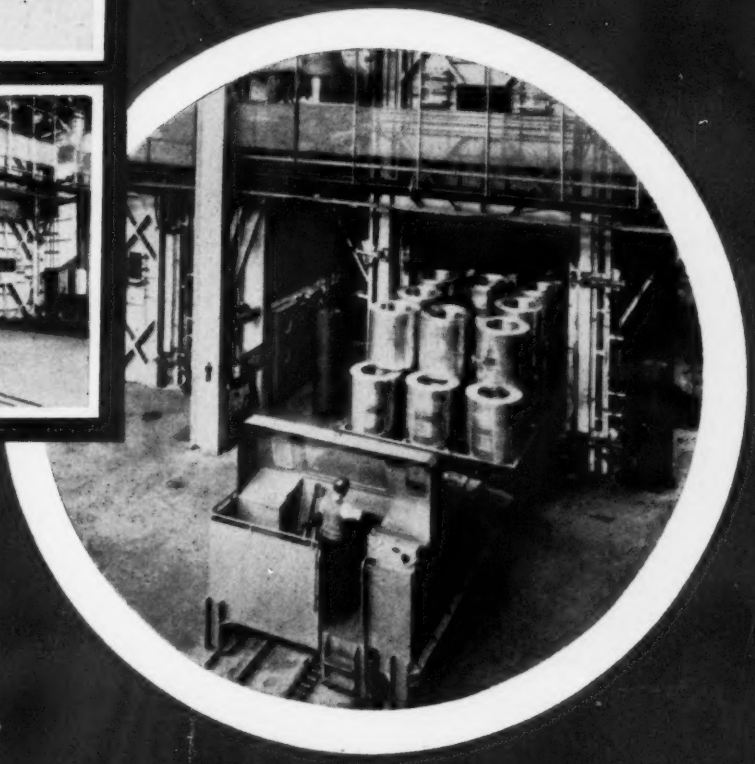
METAL CASTINGS LTD

WORCESTER

Phone: Worcester 23261 *Grams & Cables: METCAST, Worcester*







7½ tons output per hour–

ALCAN Industries Limited chose

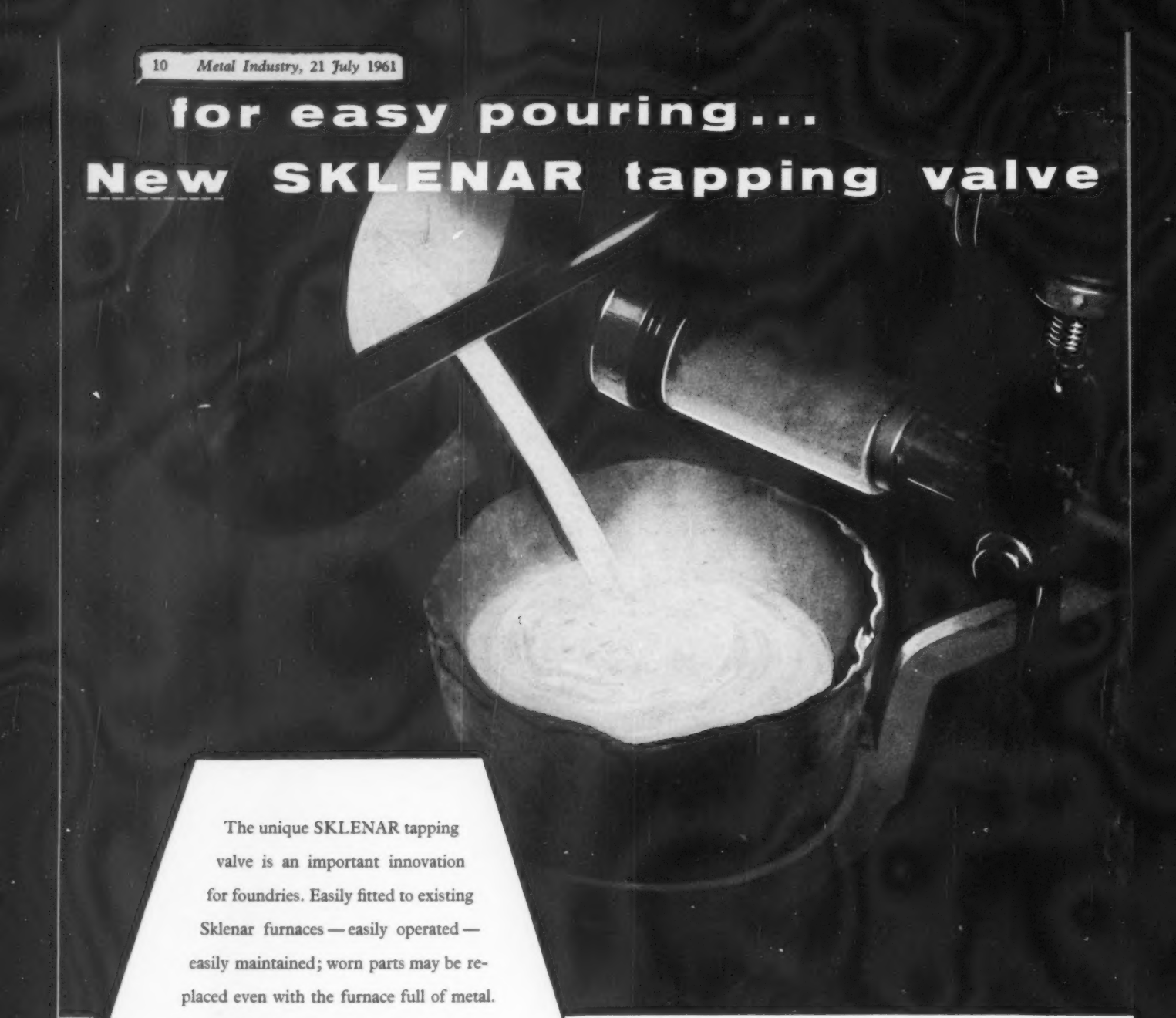
S&A Coil Annealing Furnaces

These two S&A-designed Annealing Furnaces are part of a great expansion scheme now in production. This scheme, involving more than £7,000,000 of capital expenditure, makes the Rogerstone Works of ALCAN Industries Limited the home of Europe's largest and most powerful wide hot-strip mill.

Stein & Atkinson Ltd.

Westminster House, New Road, Kingston, Surrey

for easy pouring...
New SKLENAR tapping valve



The unique SKLENAR tapping valve is an important innovation for foundries. Easily fitted to existing Sklenar furnaces — easily operated — easily maintained; worn parts may be replaced even with the furnace full of metal.

SKLENAR tapping valves, because they give a closely-controlled pour, are perfect for small mould pouring of aluminium alloys, brass, bronze, gunmetal, or copper. They can be adapted for automatic flow control.

- ***Taps below slag level***
- ***Gives instantaneous pour and shut-off***
- ***Allows complete control of metal stream***

There is nothing better – there is nothing like it!

For full technical particulars and installation instructions write to:—

SKLENAR
FURNACES LIMITED

385 NEWPORT ROAD · CARDIFF
TELEPHONE: CARDIFF 35645 (Private Exchange)
TELEGRAMS: SKLENAR CARDIFF 35645

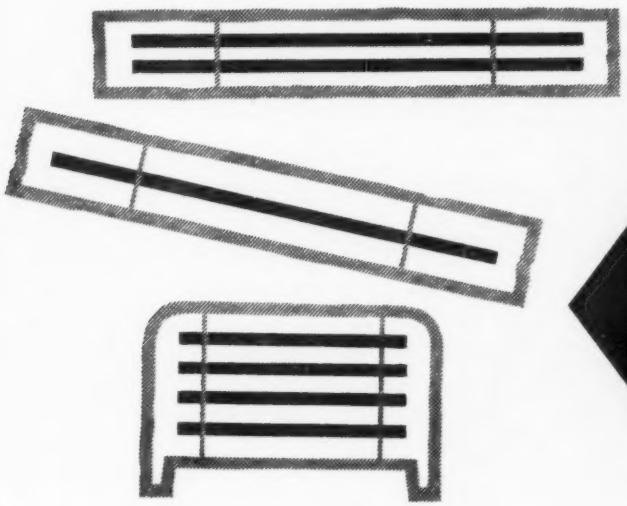
BETTER MELTING WITHOUT CRUCIBLES

VITREOSIL

REGISTERED TRADE MARK

pure fused Silica

SATIN SURFACE TUBES



SPECIALLY MANUFACTURED FOR INCORPORATING IN INFRA-RED HEATERS

A material ideal for withstanding the immediate heat from electrical Infra-Red Radiants . . . that transmits heat extremely well . . . that is the best electrical insulator . . . such is versatile Vitreosil, the finest material known for Infra-Red heating.
The Vitreosil range of Satin Surface Tubes provides an extremely wide choice of diameters and lengths; all available in large quantities.

WE INVITE ENQUIRIES FROM ACTUAL OR PROSPECTIVE MANUFACTURERS

TSL

THE THERMAL SYNDICATE LTD.

P.O. BOX NO. 6, WALLSEND, NORTHUMBERLAND ***Tel: Wallsend 62-3242/3***
LONDON: 9, BERKELEY STREET, W.1 ***Tel: Hyde Park 1711/2***

for easy pouring...
New SKLENAR tapping valve

The unique SKLENAR tapping valve is an important innovation for foundries. Easily fitted to existing Sklenar furnaces — easily operated — easily maintained; worn parts may be replaced even with the furnace full of metal.

SKLENAR tapping valves, because they give a closely-controlled pour, are perfect for small mould pouring of aluminium alloys, brass, bronze, gunmetal, or copper. They can be adapted for automatic flow control.

- ***Taps below slag level***
- ***Gives instantaneous pour and shut-off***
- ***Allows complete control of metal stream***

There is nothing better – there is nothing like it!

For full technical particulars and installation instructions write to:—

SKLENAR
FURNACES LIMITED

385 NEWPORT ROAD · CARDIFF
TELEPHONE: CARDIFF 35645 (Private Exchange)
TELEGRAMS: SKLENAR CARDIFF 35645

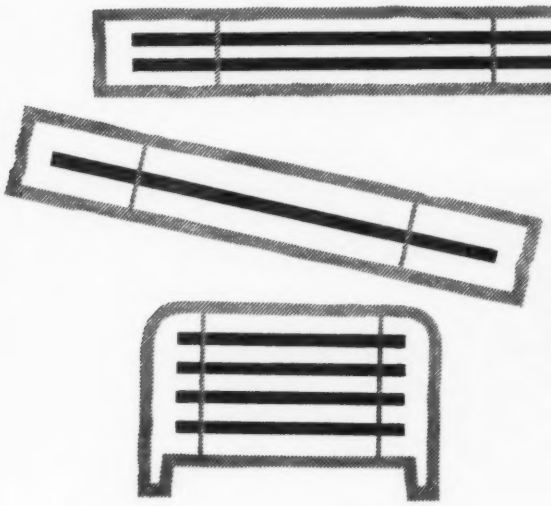
BETTER MELTING WITHOUT CRUCIBLES

VITREOSIL

REGISTERED TRADE MARK

pure fused Silica

SATIN SURFACE TUBES



SPECIALLY MANUFACTURED FOR INCORPORATING IN INFRA-RED HEATERS

A material ideal for withstanding the immediate heat from electrical Infra-Red Radiants . . . that transmits heat extremely well . . . that is the best electrical insulator . . . such is versatile Vitreosil, the finest material known for Infra-Red heating.
The Vitreosil range of Satin Surface Tubes provides an extremely wide choice of diameters and lengths; all available in large quantities.

WE INVITE ENQUIRIES FROM ACTUAL OR PROSPECTIVE MANUFACTURERS

TSL

THE THERMAL SYNDICATE LTD.

P.O. BOX NO. 6, WALLSEND, NORTHUMBERLAND *Tel: Wallsend 62-3242/3*
LONDON: 9, BERKELEY STREET, W.1 *Tel: Hyde Park 1711/2*

Sign of RS *Service*

ANODISING

A.I.D., A.R.B. and I.A. Approved

CHROMIC and SULPHURIC ACID PROCESSES
DECORATIVE SILVER ANODISING work of exceptionally long dimensions—A SPECIALITY
24-hour service on repetition work. Free collection and delivery.

ELECTRO-PLATING in Chrome, Nickel, Copper, Cadmium, Zinc, Silver, etc. Chromating, Phosphating & all other processes.
STOVE ENAMELLING. Cellulose Paint Spraying & Sand Blasting.

ROBERT STUART (LONDON) LTD.
ASCHAM STREET, KENTISH TOWN, LONDON, N.W.5 • TEL: GULLIVER 6141 6 lines

ALUMINIUM
TO ALL SPECIFICATIONS
ILFAR ALUMINIUM Co. Ltd
CANLEY, COVENTRY — Phone: 3673
ALLOY INGOTS

METALS and ALLOYS
FIFTH EDITION

The alloys listed are usually regarded as non-ferrous, and are limited to those containing not more than 50 per cent of iron. Many of them have definite "names" and the book includes not only those proprietary alloys but also many others which, although not proprietary, usually have a recognized compositon.

15s. net. By post 16s.

Obtainable at all good booksellers or from
Iliffe Books Ltd., Dorset House, Stamford Street, London, S.E.1.

Metal Finishers

FOR ALL—

The HARRIS PLATING WORKS Ltd

A.I.D. REGD. No. 153079/31.
AIR REG. BOARD AUTHY. No. A1/1268/3
D.I.ARM APPROVED No. IA/42/5/260

18 NEW WHARF ROAD, LONDON, N.1.
Telephone: TERMINUS 7263/7

HANDBOOK OF INDUSTRIAL ELECTROPLATING

E. A. Ollard, A.R.C.S., F.R.I.C., F.I.M., and E. B. Smith

Facts, figures and formulæ for all who design, erect, maintain or operate electro-deposition plant, and for laboratory workers who deal with plating solutions. Includes sections on water and drainage purifications of solutions, storage and handling of chemicals and plating-shop costing.

35s. 0d. net **by post 36s. 5d.**

from all booksellers or Iliffe Books Ltd., Dorset House, Stamford Street, S.E.1.

ON AIR MINISTRY & ADMIRALTY LISTS OF APPROVED SUPPLIERS

ALEXANDER METAL CO. LTD.

Manufacturers of
NON-FERROUS METALS

INGOTS
you can always depend upon!
AND ALLOYS
BROAD LANES
BILSTON • STAFFS
TEL: 41964-5-6
Telegrams: INGOTS BILSTON

starting something?

starting something? . . . where more pairs of skilled hands (and trained minds, too) could be useful . . . where extra Design facilities would relieve the pressure on the Drawing Office — or where, without capital expenditure, you would like to augment your own resources with additional Production of a specialised nature.

Then consult The Pickering Group, and join the many diversified industries that are using the technical knowledge and experience of this efficient consortium of Scottish companies. Here, the traditional engineering skills of almost a hundred years are merged with the *Advanced Techniques of the Twentieth Century — techniques in the Application of High Vacuum Principles to Industrial problems* — the provision of Complete Off-Shore Oil Drilling Equipment — the Fabrication of Engine Bedplates, Gearboxes, Cranes and Tanks . . . and the building of High Vacuum Units for Decorative Finishes and Optical Coatings. Even in the High Vacuum aspects of Space Research, The Pickering Group has something to offer. Your enquiries will be referred to the appropriate Technical Consultant Panel and if the job comes within the scope of The Group's activities work can be undertaken on a contract or sub-contract basis. Exploratory enquiries incur no obligation.

HIGH VACUUM EQUIPMENT For Decorative finishes and Optical coating	**HIGH VACUUM FURNACES** For Melting and Sintering
IONIZATION CHAMBERS	**CONTROLLED ATMOSPHERIC WELDING EQUIPMENT**
HIGH VACUUM GAUGE UNITS	
HIGH VACUUM VALVES AND ACCESSORIES	**FREEZE DRYING AND DEHYDRATION PLANT**
MASS SPECTROMETER LEAK DETECTORS	**DIFFUSION PUMPS**
IMPREGNATION & ENCAPSULATION EQUIPMENT	**ALPHA RAY IONIZATION GAUGE CONTROLS**

THE PICKERING GROUP OF COMPANIES

SERVING INDUSTRY IN MANY FIELDS — THE PICKERING GROUP OF COMPANIES — WISHAW · LANARKSHIRE

R. Y. PICKERING & CO. LTD. Steel Fabrications - Stern Frames - Engine Bedplates - Gearboxes - Crane Structures - Tank Work - Equipment for the Oil Industry.

VACUUM INDUSTRIAL APPLICATIONS LTD. High Vacuum Equipment - Melting and Sintering Furnaces Metal Evaporation Units - Vacuum Casting Plant - Control Equipment, etc., etc.

DANIEL VARNEY LTD. Scientific Instruments.

WOODFIELD PICKERING LTD. Complete Off-Shore Oil Drilling Equipment.

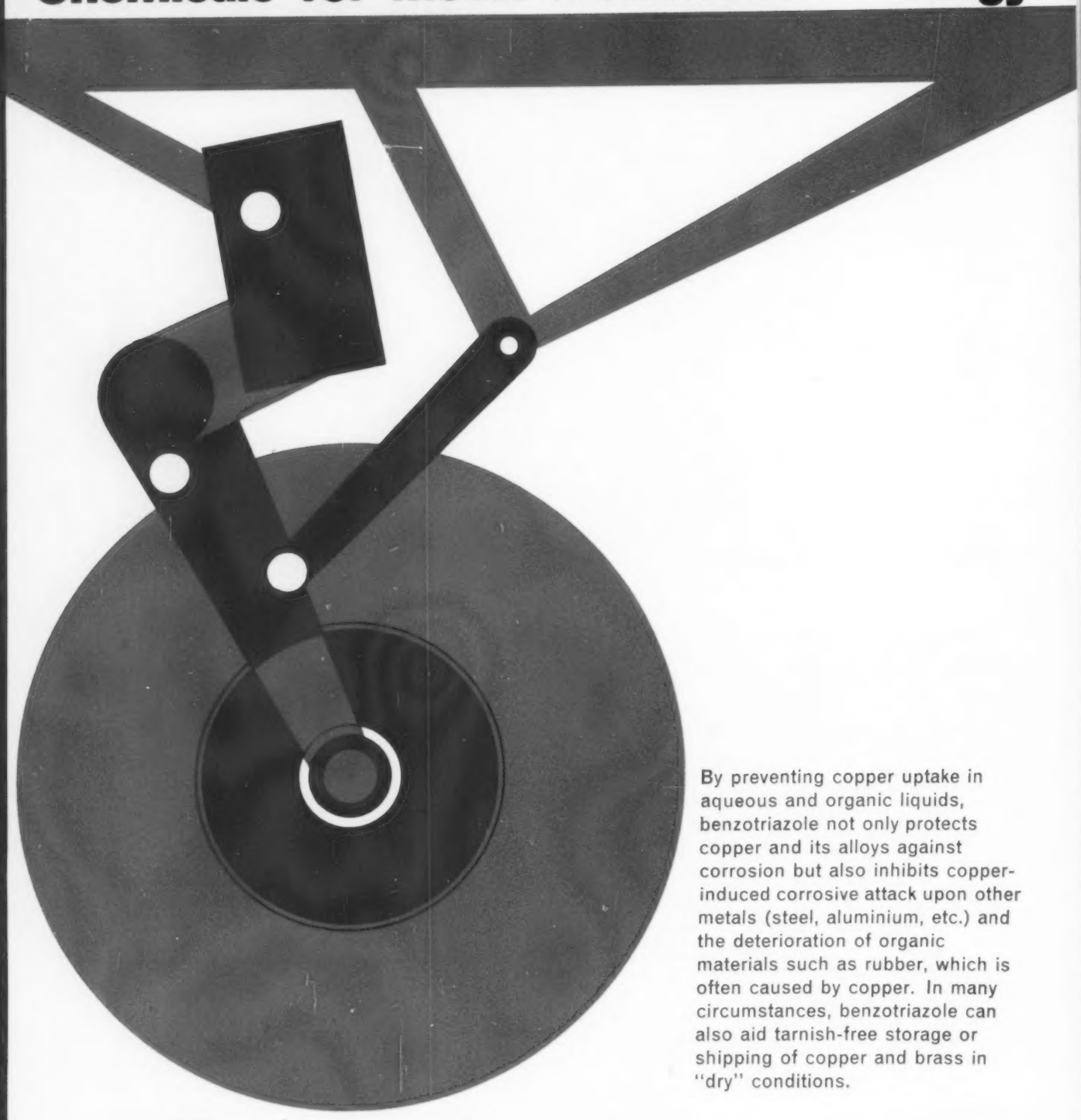
NETHERTON ROAD · WISHAW · LANARKSHIRE · SCOTLAND

TELEPHONE • WISHAW 2142 TELEGRAMS: PICKERING, WISHAW

B

Chemicals for metal treatment

Geigy



By preventing copper uptake in aqueous and organic liquids, benzotriazole not only protects copper and its alloys against corrosion but also inhibits copper-induced corrosive attack upon other metals (steel, aluminium, etc.) and the deterioration of organic materials such as rubber, which is often caused by copper. In many circumstances, benzotriazole can also aid tarnish-free storage or shipping of copper and brass in "dry" conditions.

Benzotriazole

Corrosion and tarnish inhibitor for copper and its alloys

Recommendations on request to
Development Division
The Geigy Company Limited
Rhodes Middleton Manchester

METAL INDUSTRY

FOUNDED 1909

EDITOR: L. G. BERESFORD, B.Sc., F.I.M.

MANAGING DIRECTOR: ARTHUR B. BOURNE, C.I.Mech.E.

21 JULY 1961 VOLUME 99 NUMBER 3

CONTENTS

Editorial: Current Welding Research	41
Furnace Research and Development	42
Electrolytic Smoothing	44
Reader's Digest	44
Continuous Strip Casting and Rolling. *By H. W. Brand*	45
Fluidized Bed Plastics Coating	46
Treatment of Works Effluent	47
Men and Metals	48
New Plant and Equipment	49
Friction Welding Developments	51
Obituary	51
Out of the Melting Pot	52
Industrial News	53
Metal Statistics	55
Company Reports	56
Trade Publications	56
New Companies	56
Metal Market News	57
London	
New York	
Non-Ferrous Metal Prices:	
Primary Metals	58
Ingot Metals	58
Scrap Metals	58
Semi-Fabricated Metals	59
Foreign Quotations	59
The Stock Exchange	60

© Iliffe Production Publications Ltd. 1961

Permission in writing from the Editor must first be obtained before letterpress or illustrations are reproduced from this journal. Brief abstracts or comments are allowed provided acknowledgment to this journal is given

PUBLISHED EVERY FRIDAY BY ILIFFE PRODUCTION PUBLICATIONS LTD.

Editorial Offices: 9 Charlotte Street, Birmingham 3. Telephone: Central 3206

Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Tel.: Waterloo 3333. 'Grams: "Metustry, London-S.E.1"

Branch Offices: MANCHESTER: 260 DEANSGATE, 3; telephone, Blackfriars 4412 and Deansgate 3595 BIRMINGHAM: KING EDWARD HOUSE, NEW STREET, 2; telephone, Midland 7191. COVENTRY: 8-10 CORPORATION STREET; telephone, Coventry 25210. GLASGOW: 62 BUCHANAN STREET C.1 telephone. Central 1265/6

ANNUAL SUBSCRIPTION

HOME **£3 7s. 6d.** *OVERSEAS* **£3 12s. 0d.** *CANADA AND U.S.A.* **$10.00**

INCLUDING ONE COPY OF **METAL INDUSTRY HANDBOOK,** *PUBLISHED ANNUALLY*

Long-life 'Over-All' Protection...

... because this Dutch Barn has been heavily coated with protective zinc. The life of galvanised steel is directly related to the thickness of the zinc coating. Double the thickness means double the life—for only a fractional increase in cost.

Insist on a minimum 2 oz zinc coating.

Severn Zinc
FOR GALVANISING

CONSOLIDATED ZINC CORPORATION (SALES) LIMITED, LONDON S.W.1

METAL INDUSTRY

VOLUME 99 NUMBER 3 21 JULY 1961

Current Welding Research

AN opportunity of inspecting current research work on welding problems was provided last week when the new engineering laboratory of the British Welding Research Association was formally opened by the Rt. Hon. Lord Mills. As only to be expected, the major part of the work is concerned with ferrous materials. Nevertheless, there was much to interest those more particularly concerned with non-ferrous metals.

In previous years the main emphasis was on the welding problems of aluminium alloys. This year, too, a major part of the display dealt with the significance of defects on both the static and fatigue properties of alloy N.P. 5/6 and also on the static strength of pure aluminium. So far the effect of lack of fusion and porosity have been investigated. Fatigue tests have also been carried out on butt welds in H.S.15 and H.C.15 (clad) material welded by both the TIG and MIG processes. The effects of weld reinforcement and ageing have been considered and the detrimental influence of cladding demonstrated. An investigation is also being made of the weldability of medium strength aluminium-zinc-magnesium alloys.

Nimonic alloys, too, have been investigated. The fatigue properties of argon-arc welds in Nimonic 75, 80A, and 90 have been determined, the variables for a given thickness of sheet being testing temperature, stress cycle, post heat-treatment, welding process and surface treatment. In addition, tests, at room temperature and 500°C., have been carried out on Nimonic 75 specimens with unstressed spot welded attachments. The joining of dissimilar titanium alloys has also been the subject of research.

Work on the weldability of copper-base alloys has continued and several aspects of it have been brought to a promising state. As is well known, there is considerable variation in the procedure necessary to produce sound welds in the various grades of copper. Phosphorus-deoxidized copper, although mainly used for fabrication, is metallurgically not a very suitable material for welding and autogenous welds in this material are almost invariably porous. Investigations have shown, however, that, for many purposes, zinc-deoxidized copper can advantageously replace phosphorus-deoxidized metal. Thus, for example, in the manufacture of light gauge units, such as domestic water cylinders, substantial economies can be made by the use of zinc-deoxidized copper fabricated by autogenous welding as opposed to the conventional brazing, and, already, welded copper cylinders are being produced commercially in this way. A further application has been made in the manufacture of electronic components.

The services rendered by the B.W.R.A. are not, however, confined to research. Facilities now exist at the laboratories for welding with the majority of processes available to industry, which make it possible to make trial welds on production prototypes. Apart from establishing optimum welding conditions for the product, the service helps to show what can be done with a particular welding process and to compare the use of different processes on the same job to aid in process selection. Advice is given on the basis of the best type of process for a job, rather than as a recommendation for specific equipment, although manufacturers of welding equipment work closely with the Association in providing the service.

Furnace Research and Development

SOME INVESTIGATIONS IN PROGRESS AT THE LABORATORY OF

FOR the investigation and development of furnace equipment of all the types manufactured by the company, a new Research and Development Laboratory has been equipped by AEI-Birlec Ltd.

The Birlec Research and Development Department came into being nearly 25 years ago, soon after the formation of the company. For the greater part of its existence it has been located at the company's main premises in Tyburn Road, Birmingham, but was transferred to the present larger premises at Wood Lane in 1960.

The organization of the laboratory includes four major sections dealing respectively with metallurgical processes, furnace design, gas plants and dryers and the testing of prototype equipment. A certain amount of work is also undertaken for an associate company, Birlec-Efco (Melting) Limited, and the staff is responsible for operating a pilot smelting plant for this company near Aldridge.

Among the many investigations being undertaken at the present time, those briefly mentioned in the following paragraphs are of interest to the non-ferrous metals industry.

An experimental small high-vacuum high temperature furnace unit is being used to provide both process and design data. Applications include annealing, stress-relieving, brazing and sintering.

A 15 ft. oil-fired radiant tube for furnace heating is operating in a specially constructed test rig in the laboratory. Objects of this work include the investigation of factors affecting temperature distribution along the length of the tube, the identification of operating conditions likely to lead to soot deposition in the tube, the design of a burner suited to radiant tube operation and the collection of operating data.

Also undergoing development is a radiant tube in which a proportion of the products of combustion is recirculated within the tube. The objects of this work are reduction of temperature gradients along the length of the tube and the development of a gas-fired unit which is interchangeable with the standard Birlec electric radiant tube heating element.

Two experimental electric radiant tubes are in operation, each incorporating novel features which are intended to reduce first cost, improve operating characteristics and increase working life.

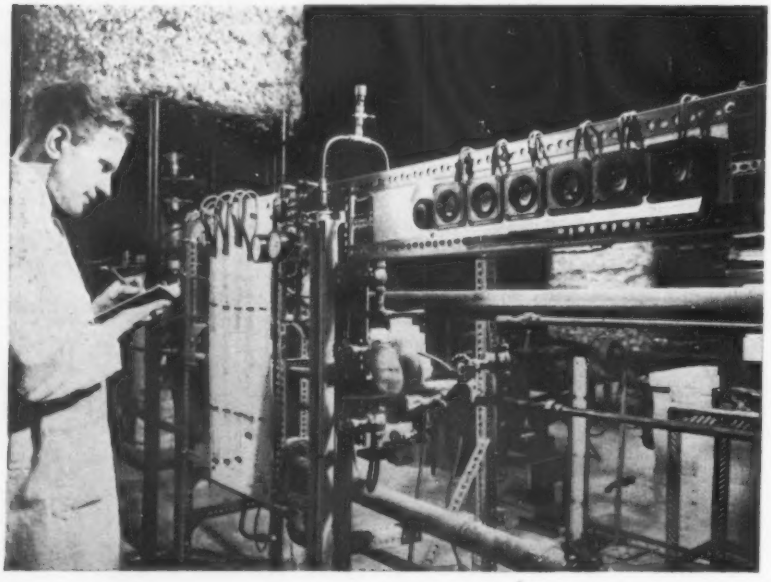
New designs for high temperature fans have been tested at furnace temperatures for prolonged periods. A test rig is under construction in which factors affecting the performance of such fans will be evaluated.

Work is in progress on the design of an improved flame curtain burner which may be used to reduce loss of atmosphere gas at furnace openings, and features promoting gas economy are being investigated.

A prototype exothermic gas plant with flame failure protection represents an attempt to reduce both cost and size of exothermic gas generators and to improve operation. A gas/air mixture is combusted in a tunnel-type burner and the product gas is cooled by being passed through a curtain of water. A plant capable of delivering 5,000 ft^3/hr. of exothermic gas is at present working in the laboratory.

The objects of the investigation in progress include the collection of data regarding the design and operation of the burner, demonstration of the efficiency of the direct water cooling unit and assessment of the quality of the product gas with regard to metallurgical applications.

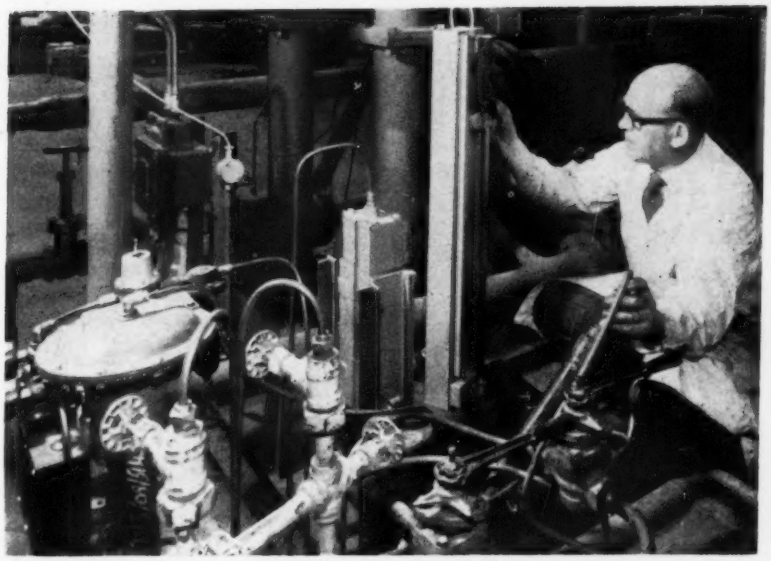
For the removal of carbon dioxide



Experimental rig for oil-fired radiant tube

General view of the A.E.I.-Birlec Research and Development Department showing some of the equipment

A.E.I.-BIRLEC LIMITED



Setting up a proportional controller on a large production exothermic gas generator

from the products of combustion of a gas/air mixture, the company already markets a standard range of stripping units of the type in which carbon dioxide is absorbed in an aqueous solution of mono-ethanolamine but work is in progress on the development of two possible alternative processes.

The first of these involves the use of a suitable adsorbent material and is similar in operating principle to the conventional gas drying equipment containing activated alumina. The equipment in the laboratory consists of a large rig in which the capacity of the adsorbent has been determined in relation to conditions of operation and reactivation.

The second process under investigation is that of the absorption of carbon dioxide in water at high pressure. An experimental unit has been erected in the laboratory and it is intended that tests should begin in the very near future.

Work is also in progress on the development of improved catalysts for use in endothermic type gas generators. Experiments are carried out in a full-scale Birlec endothermic type gas generator of conventional design.

A new series of adsorbent-type dryers for compressed air and gases has recently been marketed. The essential design data and final plant development and type testing were carried out in the laboratory. Examples of the smaller sizes of dryers in this range have been retained for experimental purposes.

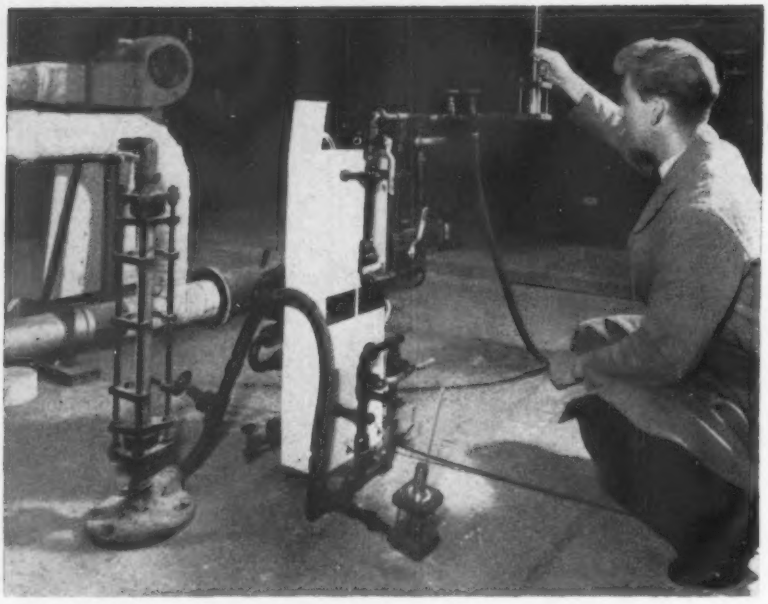
Work is in progress on the further development of the company's dehumidifying unit. Equipment has been constructed which simulates a section of standard dryer and experiments are planned in which the behaviour of different desiccants in this type of dryer will be studied.

For arc melting furnace applications, a study of characteristics of power arcs is in progress, together with an investigation of possible methods of influencing their behaviour.

Another recent study is the rate at which oxygen will diffuse into a controlled atmosphere furnace against an outward flow of gas. Experiments demonstrating the validity of the theoretical predictions are now proceeding.

Experiments are being made to develop seals suitable for use on the ends of a high vacuum continuous strip annealing furnace.

The assessment of the properties of desiccants on a comparative basis is a subject of considerable interest to the company. An appropriate technique and apparatus have been developed and are now in routine use.



Measuring the dewpoint of small compressed air dryers under test

The new laboratory is housed in a building 275 ft × 70 ft. which, including a balcony, provides a total floor area of 20,000 ft².

Electric power up to a rating of 750 kVA is distributed throughout the department, as well as town's gas up to 9,000 ft³/hr., mains water up to 4,000 gal/hr., re-circulated cooling water up to 2,000 gal/hr., and compressed air up to 18,000 ft³/hr.

An overhead crane of 10 tons capacity with a 24 ft. lift serves the entire area.

Rooms are provided for the preparation of metallurgical specimens, microscope and photographic work. Instruments available include infra-red gas analyser, Hersch oxygen analyser, Foxboro Dewpoint measuring and control units and a "moisture monitor" dewpoint instrument. A Vickers projection microscope and a wide range of temperature measurement and control instruments are also available.

Electrolytic Smoothing

SINCE the introduction of electrolytic tinning about 20 years ago, progressively thinner tin coatings have become available, and nowadays much of the tinplate has only 15 microinches coating thickness. The corrosion resistance of can exteriors made from tinplate with the thinner coatings tends, rather naturally, to be lower than with thicker coatings, and this, of course, limits the use of thinner coatings, especially in the more humid climates.

It is reasonable to expect that with very thin coatings the effectiveness of coverage will depend upon the surface area of the steel substrate. This has been confirmed by laboratory work, and since the ratio of actual area to apparent area is of the order of 5-10, there seemed to be scope for considerable improvement.

Means of reducing the surface area of blackplate prior to tinning have been studied by B.I.S.R.A. A method of electrosmoothing was developed, giving a reduction of specific area of about 40 per cent. This is a modest smoothing treatment in comparison with electropolishing but it could be achieved in a time of about 1 sec. with an electrolyte of low viscosity. Laboratory samples treated in this way and subsequently coated with 15 microinches of tin showed a rust resistance approaching that of unsmoothed samples with 30 microinches of tin. The smoothing electrolyte is a patented feature of the B.I.S.R.A. process and the mechanism is preferential dissolution of peaks on the surface of the steel. Only microroughness is removed by this method, and gross roughness, such as is measured in the Talysurf machines, is hardly altered. The effectiveness of smoothing is estimated by a double layer capacitance method.

Trials carried out at the works of two of the Association's members indicate that this B.I.S.R.A. electrosmoothing process gives better quality tinplate and have confirmed greater corrosion resistance with the thinner coatings (15 microinches).

Reader's Digest

FURNACE TECHNOLOGY

"Modern Furnace Technology." (3rd Edition). *By H. and G. Etherington. Published by Charles Griffin and Co. Ltd., 42 Drury Lane, London, W.C.2. Pp. xii + 569. Price 120s.*

THE third edition of this text book progresses further towards providing a fully comprehensive work covering the field of furnace design. The authors commence by classifying and explaining the various types of furnaces in common use, and then continue with excellent and clear explanations of the principles involved in design and operation.

Both the student and the practising engineer will find the work extremely useful, and the extensive list of references given at the end of each chapter still further increases the value of the book.

The chapter dealing with combustion and available heat covers the subject very fully, giving a theoretical approach together with some very useful examples of practical calculations. The section dealing with control equipment is, unfortunately, very brief, and in general only the function of control equipment is described, without any details of the type of equipment to be used.

The sections on gas flow and principles of heat transfer are similar to those in the previous editions, although it is interesting to note that the authors now make use of a standard temperature of 21°C. instead of the former figure of 15°C., this again being an indication of the eminently practical approach to the calculations covered by the text.

The chapter on refractory materials has been extended to cover recent new developments, particularly in the field of lightweight insulation materials. The advantages, and also the occasional disadvantages derived from the use of insulating refractories are explained, and the vast difference which their use can bring about in furnace construction is clearly shown in an example given by the authors where, for similar conditions of operation, a furnace requiring 17½ in. of firebrick would only require 2½ in. of insulating brick to achieve the same outside wall temperature. In this example, the weight/ft² of furnace wall would be reduced from 204 lb. to 6 lb. With this very considerable reduction, the use of lighter buckstays, tie-rods and foundations, etc., with all the attendant advantages, becomes possible.

As in previous editions, the final section of the book deals with physicochemical considerations, and without being too advanced, this chapter gives an excellent introduction to the subject as applying to gases, slags and metals, and the like.

L. W.

RECENT INSTALLATION IN HOLLAND PROVIDES ECONOMY WITH FUTURE SCOPE

Continuous Strip Casting and Rolling

By H. W. Brand

(*Concluded from* METAL INDUSTRY, 14 *July*, 1961)

DIFFERING from the American line in that it was mainly designed for more moderate European conditions, the Dutch continuous casting and rolling line was laid out for present demand only with the possibility of increasing the output by adding on units at a later date. As the European wage structure is so different from that in the U.S.A., the labour saving features of this line are not so pronounced as on the American line. Automatic operation has been introduced only where it is essential for the quality of the strip or for continuous and absolutely safe working of the installation. For instance, the automatic feeding of the strip into the coilers was not adopted here, as the strip is coiled after one reduction in the first rolling mill and, therefore, only runs at half speed. The feeding of the strip into the coilers is left to an operator, as in any case one man has to be available for removing the coils.

At present, the line consists of one 6,000 lb. melting furnace, one rotary casting machine, one rolling mill, an hydraulic shear and two recoilers. In addition, and separate from this unit, a two-stand, four-high tandem mill has been installed as a finishing mill, and one rotary gang slitter for further processing.

As the strip produced on this line is not used mainly for slugs, but forms mostly stock for other products, the cold reduction has to start after one hot rolling pass. For this reason, the rolling mill was designed in such a manner that it can be converted very quickly into a cold breaking down mill. The present output requirements permit cold breaking down passes on the same rolling mill, during which time the casting machine is not in operation. Incidentally, whilst the rotary casting machine is not in use the furnace feeds a semi-continuous billet casting machine, so that the furnace operators are continuously engaged.

Converting the hot mill into a cold mill takes approximately 2 hr. The complete set of hot rolls is withdrawn from the frames and replaced by a set of cold rolls. The uncoiling box with roller leveller, which during hot operation is covered by the roller table, is uncovered simply by removing the swivelling portion of the roller table, and a sleeve is mounted upon the drum of the front spider recoiler. As this work has only to be carried out approximately once a month by the mill operators themselves to achieve the present output programme, the required time of 2 hr. has little effect on the economy of the line.

Strip which has reached its final gauge after one or two cold breaking down passes, i.e. any gauge down to 0·100 in., is removed from the line and forms the stock for the blanking presses for slugs or for the tube welding line. All other strip receives its normal heat-treatment and then further reductions on the tandem cold line.

When, at a future date, increased output is required, a further furnace will be installed and a separate cold breaking down mill will be erected behind the coilers of the hot mill. The complete set of rolls, including chocks and bearings, is already available for this second mill. The pay-off box with the roller leveller will be moved from

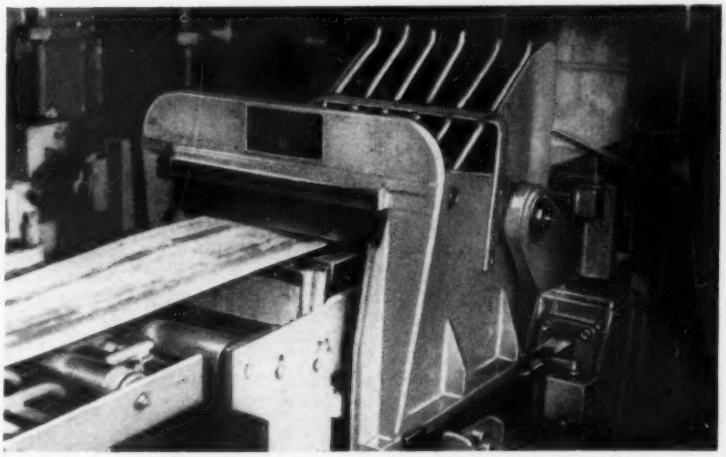
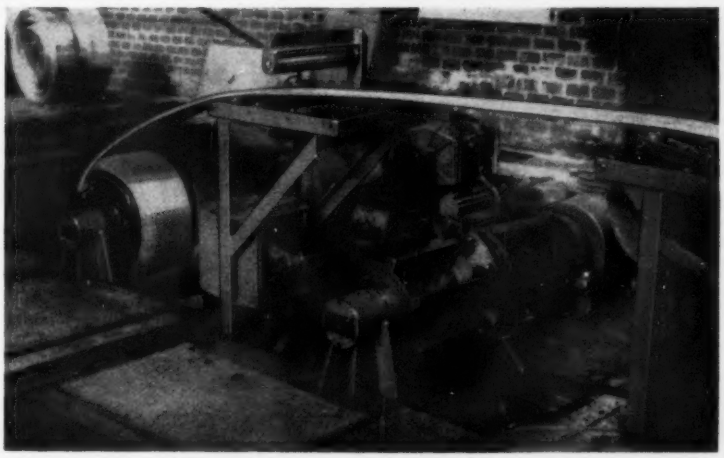


Fig. 5—Hydraulic travelling shear on exit side of hot rolling mill. Here the strip has been reduced from 19 mm. to 9 mm.

Fig. 6—The 9 mm. strip being coiled on Coiler No. 2. Coiler No. 1 is standing by to accept the next coil. Behind the coilers are the contact rollers. In the background a finished coil can be seen



the entry side of the hot mill to the entry side of this new cold breaking down mill. To increase the output of narrow thin strip on the tandem line, a third stand would be added between the second stand and the recoiler. All the necessary foundations for the second stage have been laid at the same time as foundations for the first erection stage, so that at the later date, when the extension takes place, production will only need to be interrupted for a very short time and no earth moving need be carried out. The electronic control gear for the tandem mill has been designed in such a manner that the controls for the third stand can be included with the least possible cost and labour.

All tanks and pumping stations for both soluble oil on the hot line, and rolling oil on the cold tandem line, together with all hydraulic power packs, have been placed in specially built cellars, which again are large enough to take the equipment for further extensions.

The output of the complete installation is very difficult to determine, as it depends largely on how much of the strip can be regarded as finished after the first or second cold reduction and how much of the strip has to be re-rolled. It is easily recognized, however, that the described extensions can double the output of the present line with very little additional capital expenditure.

As the most suitable strip width for this casting line, 9 in. was chosen, to produce a finished edged trimmed strip of 8 in. Naturally, any narrower width than 8 in. can be slit on the rotary slitting line to suit all requirements of the tube welding installation.

As this is a continuous casting process, any size of coil can be produced, but when determining the size of coil, one should watch very carefully whether the advantages of a large coil, in fact, justify the higher expense of the complicated coiler drives and the annealing plant. In this line, a diameter of 40 in. has been chosen, as this size coil only requires coiler motors with a constant horsepower range of 2:1 on a 20 in. drum diameter and gives very reasonable running times on the tandem mill, where the second stand runs at a maximum speed of 900 ft/min. The actual running time and rolling speed result in a very good loading factor of this mill. After adding a third stand to this tandem mill, the loading figures will be even better.

The costs can easily be calculated. The capital expenditure for a line with 200 installed kilowatt is approximately £60,000 to £65,000. Adding the local costs for four operators (including the furnace), the prevailing price for pig and the melting costs, which are the main governing factors, it will soon be realized what reasonable production costs can be achieved.

When calculating the melting costs, one has to take into consideration approximately 1 per cent melting losses and the required oil consumption (the Dutch line is operated with an oil-fired furnace, whereas the American line has a gas-fired furnace), which is approximately 20 gal/ton of aluminium melted. When using Sklenar furnaces this amount can possibly be reduced. Another very important factor which must not be overlooked when calculating the economics of such a line is the amount of rolling work necessary to achieve the required end product. This factor becomes apparent when one compares the two extremes. The most economical product would be strip, which requires only one or two hot reductions in order to satisfy the requirements with respect to end thickness, surface finish and metallurgical properties of the strip. The least economical product would be aluminium foil, as the effective rolling costs (not taking the capital expenditure into account) for narrow strip are not less than the rolling costs for wide strip. On the contrary, they exceed the costs for wide strip if based on weight units. This makes it quite clear that these lines are not of such great interest for plants which already possess large and expensive sheet and wide strip mills, as they are for the end user of large quantities of slugs or of narrow strip. One exception may, perhaps, be that of a large plant requiring to extend its capacity for one special product.

The casting machines Mark III are available in four standard sizes: for strip between 4 in. and 8 in. width, for strip between 8 in. and 12 in. width, for strip between 12in. and 16 in. width, for strip up to 20 in.

Naturally, the bigger machines can be used to produce any narrower strip but for each width a separate casting wheel rim has to be used to ensure that the centre of the cast strip is in line with the centre of the rolling mill and so that the strip can be fed in a straight line over the carry over bridge into the edging and the rolling mill.

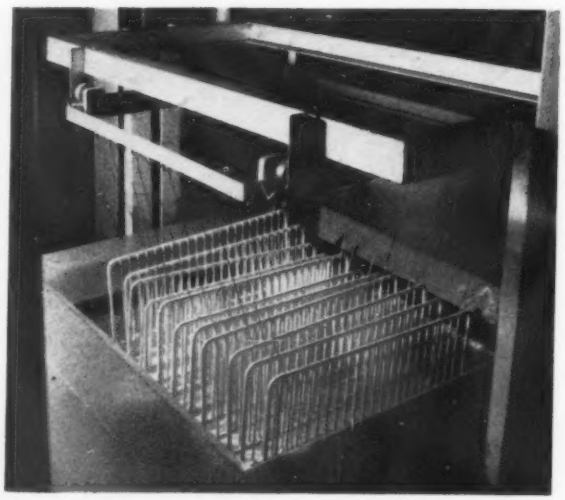
When determining the most suitable width of the line, the potential user should carefully investigate his actual requirements as the capital expenditure rises very rapidly with increase in width and the corresponding need for larger sizes of mills. Furthermore, the output of the wider lines in most cases exceeds by far the actual requirements, so that these lines cannot be operated on a fully continuous basis, which, naturally, reduces the economy of such a line to a great extent. These lines, by reason of the extremely low metal conversion figures are amortized in a very short time, sometimes even within one year, provided that they have been chosen correctly, and it is, therefore, a mistake to try and save installation costs by using old, existing rolling mills, as in such cases, generally, the running costs render the installation uneconomic.

Fluidized Bed Plastics Coatings

A COMPACT, semi-automatic machine capable of the full cycle for the fluidized bed coating of metal parts, such as wire baskets, plating racks, jigs, etc., with plastics has been produced by Dohm Ltd., of 167 Victoria Street, London, S.W.1. It occupies 9 ft. 6 in. by 4 ft. 7 in. floor space—a feat made possible by the overhead position of the oven.

The machine consists of: oven, powder tank, water tank, fluidizing air pressure box complete with blower and motor, hydraulic lowering/lifting gear complete with ram, pump, motor and controls, two trolleys, and electrical switchgear.

To facilitate changes of colour and/or type of material, the powder tank is removable and replaceable by spare tanks which, when not in the machine, can be used as storage bins.



Articles to be plastics-coated, after heating in the overhead oven are dipped in the aerated dry plastics powder in the tank

PROBLEMS OF OPERATING FULL-SCALE ION EXCHANGE PROCESS

Treatment of Works Effluent

A PLANT, based on the ion exchange process, was installed to deal with waste water from metal finishing operations at Morris Motors Ltd. The plant decided upon consisted essentially of two mixed bed ion-exchange units, fed through one of a pair of sand filters from a sump holding 7,000 gal. of swill water. The de-ionized water should be re-circulated to the plating shop at an average flow of 8,000 gal/hr., with a head of 40 ft., the quality controlled by conductivity cell and meter.

This plant was designed to cope with an effluent having an ionic load equivalent to 225 p.p.m. $CaCO_3$, with an acidity of 35 p.p.m. HCl.

A strong acid sump of 10,000 gal. capacity would collect regeneration liquors and effluent of high ionic load to be dealt with in the conventional treatment unit. Here, final disposal would be effected, after reducing hexavalent chromium with sulphur di-oxide, neutralization and precipitation with lime slurry at controlled pH, and clarification by settlement in a large circular concrete pit holding approximately 10,000 gal.

The sludge resulting from the process would be withdrawn from the bottom of the tank by hydrostatic head through a pipe leading to a side sludge sump for subsequent removal. Provision would also be made for the disposal of cyanide-containing solutions, by chlorine oxidation in alkaline solution.

The plant began operation in 1957, but difficulties were encountered, including greater frequency of regeneration than expected, necessity for short runs due to greater ionic load, precipitation of heavy metals, greater loss of water during recirculation, and inefficient regeneration technique. A number of other problems were also encountered, and full operation was abandoned very early. In 1958 new equipment was installed, to modify some details of the process, and satisfactory results were obtained.

AMONG the Papers presented at this year's annual conference of the Institute of Metal Finishing at Llandudno was "Treatment of Works Effluents", by A. A. L. Pearson and G. G. Parker. An abstract of this Paper, which raised some interesting problems of installation and operation of large scale ion exchange systems, appears above. Some of the chief comments from the discussion which followed its presentation by A. A. L. Pearson are given below.

DISCUSSION

W. G. L. Miller (Ford Motor Co. Ltd.) said the ion exchange treatment required made a tangible contribution to the solution of the problem of effluent treatment, and one could only hope that the added inducement of cost reduction in certain circumstances would cause others to adopt similar systems. He envied the authors in having a local authority which permitted discharges containing 5 p.p.m. of copper and cyanide, and 7 p.p.m. of chromium. Perhaps, too, they were a little ungenerous in describing the permitted 1,000 per cent increase in impurity as a "slight" relaxation of requirements.

Demineralization, by permitting the re-use of water after purification, could reduce the water demand by as much as 90 per cent but did not in any way reduce the total quantity of toxic materials in the combined discharges from the plating shop, and this perhaps might be emphasized more strongly. The resultant lower volume of total discharge mainly required a correspondingly more efficient effluent treatment, planned to meet local requirements of the order of 1 p.p.m. in respect of other toxic metals. Emphasis should be placed on the need for a sufficiently large plant to handle effluent. In their own plant trouble had occurred with resin beds, but the addition of carbon to filtration had cured the problem.

Was the need for caustic discharge, to raise the *p*H of the demineralized water, specifically connected with chromium plating troubles? In any case, what were the ill effects produced?

E. A. Ollard (Atlas Plating Works Ltd.) said effluent treatment was essentially a local matter. In London, conditions were different from almost anywhere else, and certainly differed from those described in the Paper. Factory effluents were only a very small proportion of the total London sewage. The L.C.C. was very concerned that poisonous or irritant gases should not be released in the sewer and it was possible that one organization could put down cyanide, and another acid, producing a gas which could have fatal results. An appreciable percentage of cyanide was, however, permitted.

In their own case, cyanide had been the principal trouble. To reclaim the water in the factory would have been too expensive and would probably have involved a larger plant.

Their main concern had been to get acceptable effluent. It was first necessary to segregate the various swills from the processes. This was quite a problem in a building which was already loaded to capacity. They had managed it by putting in a double layer drain. One of the difficulties in disposing of cyanide was the presence of nickel. The nickel cyanide became apparent in the test applied by the authorities and was extremely difficult to break down.

S. A. Benn (The Permutit Co. Ltd.) said that they had installed this plant, the first of its kind. Its object was to recover some 7,500 gal/hr. of swill continuously, as this constituted an acute embarrassment to the sewage authorities by reason of the volume.

In the initial installation it had been necessary to have scavenging films ahead of the ion exchanger merely to remove foreign matter. It was impossible, of course, to effect any real segregation. It was decided that they would, as was necessary, separate the cyanides. They had taken the whole swill effect, and passed it to an ion filter plant for complete demineralization on a re-cycle basis. The ion exchange plant had to be regenerated from time to time. The concentrated reject from that plant went to a neutralizing plant and was continually neutralized in the conventional way. The same plant was used to neutralize bulk discharges at weekends.

During the initial operation of the plant certain difficulties were faced. They had been getting down the drain strong acid shots which should not have come down, and this was eventually overcome. Another problem was the fact that at one time they were treating a water supply highly polluted organically. They had had trouble with the precipitation of metals on the anion resin mixed bed units. To overcome this they had put in two cation units which acted as scavengers.

The figures given for amortization of the plant for demineralization and neutralization, as compared with neutralization of the whole plant, were not realistic. Discussing these, he submitted that the figure of 9s. 3d. per 1,000 gal. for the cost of the recirculating and disposal plants should more properly be 7s. 6d.; and the figure of 3s. 6½d. for a possible conventional disposal-only scheme should be about 7s. Instead of 5s. 5½d. for deionized water, itself a very conservative figure, one then had the figure of about 3s., representing the cost of getting deionized water on a full recovery basis and making the industry more or less independent of external water supplies.

Dr. V. E. Gripp (The Permutit Co. Ltd.), referring to the difficulties associated with shut-downs, which had been mentioned in the Paper, said that the shut-down period was not very extensive. They had had very short "runs" and even when they had eliminated the strong solutions being dumped for treatment they had found that the resins did not work. From tests on site and in the laboratories they had come to the conclusion that the exchange materials had been hopelessly poisoned. This had led them to examine the content of the resins and they had found considerable quantities of complexed cyanides and other organic materials which were not readily removed by the regeneration technique.

After a further passage of time and a considerable amount of investigation, they had worked out a chemical process for reactivating the resins, removing the complexed cyanides, the additives of nickel, etc., so that the original exchange capacity could be restored. This they had been able to achieve on the planned scale and the plant had gone into operation during the summer of 1958. He understood that it was still working with the original charge of resins, which had subsequently

been depoisoned. For this purpose they had not used the standard anion exchange material but had drawn a rather unusual material from their production — with a somewhat different amount of cross-linking so that it could better resist the poisoning characteristics. Subsequently, they had gone further in this field, and the results obtained with the plant had been well substantiated in other large establishments.

J. Chadwick (Joseph Lucas Ltd.), referring to the statement that recirculated water with a conductivity as low as 1×10^{-6} mhos had been obtained, asked whether this purity had been maintained in practice over long periods? Could details be given of the various rinse waters before purification? How much water was added to compensate for losses in recirculation? On a rough estimate this would appear to be 250 gal/hr.

G. Griffiths (Triumph Engineering Co. Ltd.) said that the authors had mentioned contamination by heavy metals. Was this not expected? Had the plant not been designed to take this? Would the authors indicate which anions and cations were expected to be removed on a mixed resin bed of the kind described? From the section describing the plant as it was operated now, it appeared that the original scheme for separating the weakly contaminated wash waters from any occasional heavily loaded liquors by conductivity cell and valves had now been abandoned. Did this mean that all the effluent now passed through the ion exchange resins, or had some other method of protecting the resins from exposure to this occasional heavy contamination been introduced?

He was not sure which parts of the scheme were operated on a batch process and which were continuously flowing. He would imagine that the ion exchange system for wash waters was a continuous flow, but would like clarification as to whether the actual disposal part was or was not.

Finally, the authors had mentioned a 50 per cent excess of SO_2 being needed to reduce the hexavalent element in trivalent chromium. What did this mean in terms of parts per million of SO_2 in the discharged effluent?

Dr. D. N. Layton (Ionic Plating Co. Ltd.) felt that the Paper brought home the cost of dealing with effluents in this way. Surely the first thing to do about effluent was to reduce it as much as possible in both volume and degree of contamination by the us eof commonsense, counterflow principles, etc.

Taking steady-state conditions, assuming that the plant was running at full production and had been for a sufficient number of months, the concentration under average operation could be studied, and a series of linear simultaneous equations such as were quite easily solved were all that was necessary. One was then faced with a much smaller volume of effluent with a certain degree of contamination.

AUTHOR'S REPLY

G. G. Parker (Morris Motors Radiators Branch), replying, said that the need for caustic soda dosing had been partly brought about by the thought that there might be staining, but mainly because they had expected corrosion from brass taps, etc. In point of fact, when the caustic soda had broken down this had proved to be no trouble.

The reference to strong acid being discharged frequently and causing trouble prompted him to say that it was really partly due to the conductivity cell in the effluent being much too sensitive. While there was acid coming down at certain times it was not so strong as would seem from the reaction of the cell. Only a very small part of the effluent was in the category said to be highly contaminated with organic material. They had an artificial pool from which they drew water for certain purposes. It was used in only a very small part of the plating shop, and he did not think that it constituted a great problem.

The treatment of the ordinary swill water was clearly a continuous process, but some batch treatment was carried out —perhaps once a fortnight. This had been reasonably satisfactory. Strong acid solutions, soda rinses, etc., were also treated in this way. A conductivity cell placed in an appendix to the main flow to control influent waste water had proved very inefficient. This was unfortunate as it was in a key position and would have relieved part of the problem if operating satisfactorily. With the greatest of care nickel solutions occasionally leaked, producing quite high loads, which were not always detected in time.

Referring to the 50 per cent excess consumption of SO_2 in the reduction of chromium, he said that the relatively small amount of sodium sulphide produced was insignificant compared with the many thousand parts per million of sulphates in the effluent.

MEN and Metals

A number of University posts were announced last week by the Birmingham University Council, and among the appointments were the following: **Mr. B. Henderson** to be Research Fellow in the Department of Physical Metallurgy; **Mr. G. R. Ogram** and **Mr. B. Walker** to be Research Fellows in the Department of Industrial Metallurgy.

Previously on the staff of the Morgan Crucible Company Limited, **Mr. P. C. Fryer,** B.A., has joined the Lead Development Association, where he will be principally engaged in development work for the lead industry in the battery field.

It has been announced by the George Cohen 600 Group Limited that **Mr. John P. Bolton** has been appointed managing director of their Australian subsidiary, George Cohen, Sons and Co. (Australia) Pty. Limited. He succeeds the late Mr. C. A. Bell.

Recent news from the Imperial Smelting Corporation Limited is that **Mr. M. I. Freeman** has been appointed deputy chairman of the Corporation and that **Mr. H. V. Casson** has been appointed a director.

General manager of the production products division, **Mr. Frank Bradford,** and **Mr. Frank Smith,** A.M.I.Mech.E., the general sales manager, have both been co-opted to the board of directors of Headland Engineering Developments Limited.

A new corporation to provide research, technical information, investment advisory and management services in the United States and Europe has been organized by **Dr. Clyde Williams** and his American and European business associates. In addition to Dr. Williams, **Dr. F. R. Hensel, Dr. L. Kermit Herndon** and **Mr. H. H. Jackson** have been appointed to the board of directors. Officials of the corporation will be Dr. Williams as President and chairman, Mr. Jackson as executive Vice-President, **Dr. H. E. Zentler Gordon** as Vice-President, and **Mr. Clyde Williams, Junr.,** as secretary and treasurer.

Various board changes have been announced by Birmid Industries Limited as follows:—**Mr. W. Brindley** (managing director of Dartmouth Auto Castings) has been appointed to the board; **Mr. G. A. Rider** (deputy managing director of Birmid Industries) and Mr. Brindley have joined the board of Sterling Metals Limited. **Mr. F. S. Taylor** has been appointed a director of Perry Barr Metal Company Limited and, following the acquisition of Sterling Foundry Specialities, **Mr. Rider, Mr. W. C. Jordan** and **Mr. E. Player, Junr.,** have joined the board, with Mr. Rider as chairman.

An announcement from New Broken Hill Consolidated Limited states that **Mr. R. C. Atherton** and **Mr. W. W. Connor** have been appointed directors of the company.

News from the United States is to the effect that **Dr. John T. Norton,** Professor in the Department of Metallurgy of the Massachusetts Institute of Technology, received the Plansee Plaque awarded at the Fourth International Plansee Seminar, held in Reutte, Tyrol, Austria. Prof. Norton is the first American to receive the plaque, which is given in recognition of fundamental contributions in the field of powder metallurgy.

In consequence of the death of Dr. E. Hammond, **Mr. E. Davison,** B.Sc., A.M.I.C.E., has been appointed acting technical manager to Lafarge Aluminous Cement Company Limited.

At the annual general meeting of the British Welding Research Association last week, **Sir Charles S. Lillicrap** was re-elected as President of the Association, and the following were re-elected to the Council:—**Mr. D. J. W. Boag, Mr. C. H. Davy, Mr. T. McIver, Mr. R. B. Shepheard** and **Dr. T. W. F. Brown. Viscount Ednam** and **Mr. W. Muirhead Watson** were additionally elected to the Council.

New Plant and Equipment

Stress Analysis

WITH provision for use either as a diffused light or as a transmission instrument, the Sharples 5½ in. diameter polariscope has been designed for serious research work, university and technical college lecture purposes and as a practical engineers' tool for the assessment of designs.

Each type has, of course, distinct advantages over the other.

In the diffused light set-up, a 60 W sodium vapour lamp of the tube type is used for producing monochromatic light, and two 150 W tungsten filament lamps are used for white light illumination.

As it is not advisable to switch sodium lamps "on" and "off" frequently, a shield, rotatable by an exterior knob, is provided to exclude light from the sodium lamp when the tungsten lamps are in use.

To convert the diffused light polariscope into a transmission type, it is only necessary to replace the existing lamphouse with a special platform which carries a 250 W compact source mercury vapour lamp, a 150 W tungsten filament lamp and a 6 in. dia. condenser lens of optical quality.

The camera lens also serves as a projection lens and a glass screen to accept tracing paper is fitted to receive the projected image.

Polaroid discs, 5½ in. in diameter, and quarter wave plates, all mounted between glass, are carried in cast aluminium housings and can be rotated separately through 360° as required, their rotation being conveniently read off scales fixed to their housings.

The optical effect of the quarter wave plates can be cancelled out by setting each plate to an appropriate position without their actual removal, this being necessary when plane polarization is needed for the examination of isoclinics.

Resetting of the quarter wave plates quickly converts the polariscope back into a circularly polarized instrument for examination of the isochromatics.

Process Heating

BY introducing three new high-efficiency models of greater power output than any previous equipment in their range, Delapena and Son Ltd., of Cheltenham, have extended their range of radio-frequency induction heaters.

The new models, all with a nominal output frequency of 150 kc/sec., are to be known as the E 75, E 75/100 and E 100. The E 75 and E 100 have continuous output ratings (To B.S.1799) of 75 and 100 kW respectively, while the E 75/100, with a continuous output of 75 kW, has the additional valuable facility of intermittent operation at up to 100 kW output with 1 min. stand-by intervals, so long as the average output does not exceed 75 kW. At 100 kW, for instance, the maximum period on load is 3 min, and at 85 kW, 7½ min.

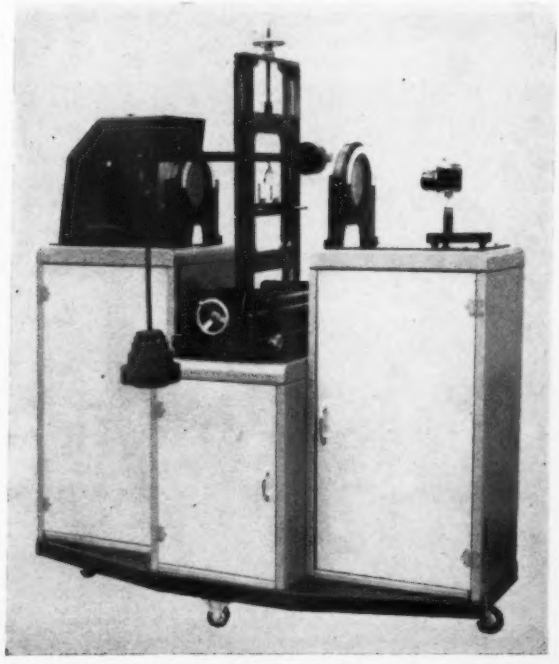
High efficiency when operating with a wide range of inductors and workpieces can be maintained: by the use of alternative high and low impedance output terminals in conjunction with the use, when necessary, of a specially-designed external high-efficiency r.f. transformer; by means of an external voltage regulating transformer which enables the output power to be varied over a range of 16:1; by the provision of variable kVA boost, adjustable both by removable links and push-button operated contactors.

All main circuits are adequately protected by overload devices and special attention has been paid in the design to ensure maximum operator safety by the provision of a number of safety switches and interlocking safety circuits.

Diamond Lapping

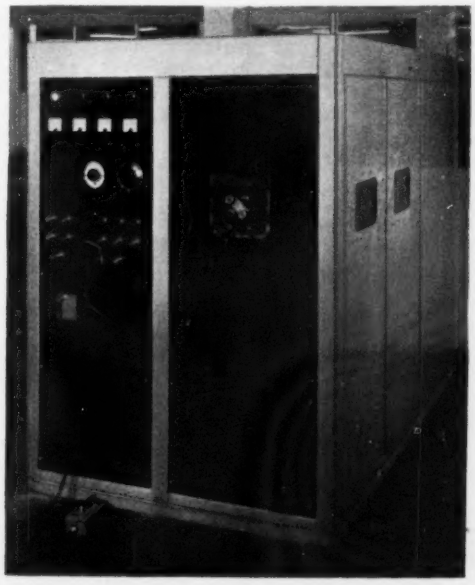
A NEW precision flat lapping machine, 18 in. high by 11½ in. wide by 22 in. long and weighing 108 lb., has been introduced by Engis Ltd., of Maidstone, Kent. It is driven by a ¼ h.p. electric motor running at 1,420 r.p.m. The drive is transmitted through self-aligning couplings to a vertical spindle revolving in self-sealing ball races at 75 r.p.m.

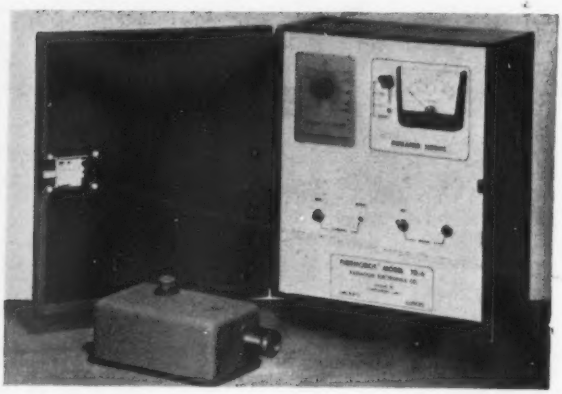
Five interchangeable close-grained cast iron lapping plates of the lift-off



Left—The Sharples 5½ in. diameter polariscope

Below—The Delapena induction heater, Model E75





Left—The Engis precision flat lapping machine

Above—The 'Thermodot' model TD-6 radiation thermometer equipment

type, which have been hand scraped and then lapped with different grades of Hyprez diamond compound can be supplied with each machine. A workholder or lapping jig to suit several different shapes and sizes of workpiece is being developed. When worn, the lapping plates can be resurfaced on master plates of the appropriate grades.

Stock removal rates are high, and progressive lapping with the appropriate grades of Hyprez compound obviates pre-treatment of the workpiece with abrasive papers before the final surface finish is applied.

The machine is suitable for production runs of pump seals, valve seats, knife blades and other components which must be finished to a high degree of exactitude and flatness. It is already being used on the production of semi-conductor materials for experimental purposes.

The plate revolution speed of only 75 r.p.m. allows the operator to hold the work by hand. Surface flatness down to one light band, and surface finishes to one-millionth of an inch (Centre Line Average) can be obtained in a matter of minutes.

Heat Control

A RANGE of radiation thermometers, under the trade name "Thermodot", is being made available in the United Kingdom and Eire by West Instrument Ltd., of Brighton. Basically, the distinction is between high precision models for research and development and other types for constant production use. The speed of response, particularly on the TD-1, the research model, is so high that it is giving engineers facilities hitherto unavailable for recording rapidly changing temperature patterns and "heat spots". This has been the case in research on high speed tyre rotation, turbine exhaust characteristics, glass annealing, steel strip production, plastics extrusion and moulding and coating processes and wind tunnel work. In production processes, it has been possible to define cycles in heating systems.

Both types operate on the response of an infra-red detector which generates a signal voltage accurately proportional to the radiation density.

In the case of the model TD-1, an optical chopper is used which may be stopped and transient phenomena as brief as 10 microseconds in duration may be observed, measured and recorded. With the model TD-3, specifically designed for industrial use, the instrument is normally supplied with an indicator and indicating controller or recording potentiometer. The power supply is panel mounted and may be located some distance from the optical head.

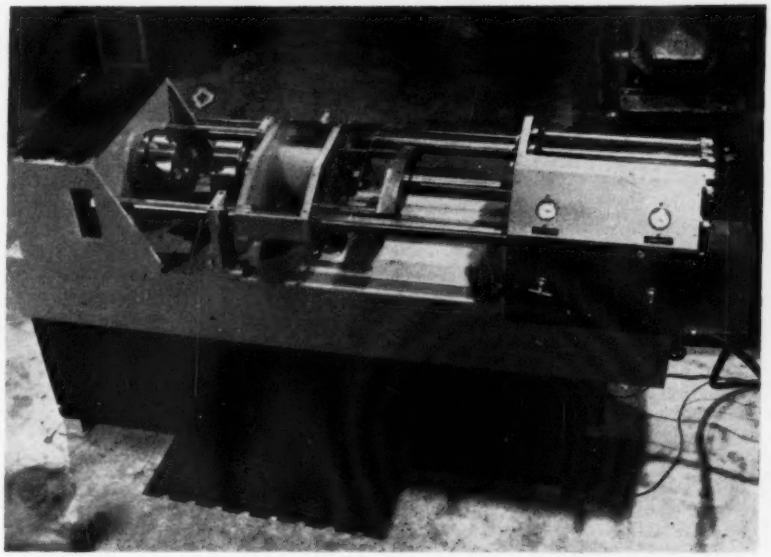
Versatility is a marked characteristic of this equipment: the TD-1 will function from 100°F., and the industrial TD-3 from 180°F.

For the machining of irradiated uranium, a special-purpose remotely controlled lathe has been designed by PERA (Production Engineering Research Association). The workpiece is contained in a totally-enclosed cutting area, control of the operation being achieved via the console on the left. In the illustration below the operator is shown adjusting the cross-slide control. Twin-head air gauges are shown on the right

Friction Welding Developments

FRICTION welding has been put to practical use in the Soviet Union and is being applied in a number of production plants. The general belief is that the process is a Russian invention but, in fact, British Patents were taken out during 1941 and 1942, whereas the Russian Patents were not registered until February, 1956.

The process is basically very simple. It consists of placing the ends of two bars in contact and rotating one of them, the frictional forces at the interface generating sufficient heat for welding to take place when the relative motion is stopped and sufficient force applied. Friction welding can be placed under the heading of pressure welding, the weld joint being made without the application of any external heat source. The process has some of the advantages of the more commonly known resistance welding processes, but in addition requires much less power.



The prototype friction welding machine constructed at the laboratories of the British Welding Research Association

Basic Design

A machine, demonstrated last week in the British Welding Research Association's laboratory, was designed and manufactured by the central machine shop, which forms the main service department for the establishment. Cost, manufacturing facilities and time available to some extent dictated the design. Again, some aspects of the design have been influenced by the need for instrumentation with respect to existing recording equipment.

The machine has an approximate maximum welding capacity of 1 in^2 in mild steel and is powered by a standard 10 h.p. motor at 950 r.p.m. The axial force is provided by a 12 in diameter double acting air cylinder which, with the 100 lb/in^2 air line, provides upset and friction forces to a maximum of 5 tons.

The drive is by power grip timing belt and stepped pulleys, allowing speeds of 430, 640, 800 and 1,200 r.p.m. to be selected quickly and at a relatively low constructional cost.

The major mechanical problem involved is that of arresting the revolving head. The costs of doing this by a clutch, reversing the phases on the power supply to the motor or by capacitor injection are all high and would have added several months to the construction time. The alternative solution was to allow the stationary shaft to accelerate up to the speed of the decelerating driven shaft which may also be further decelerated by a solenoid operated brake (to be added later).

Release of the stationary spindle is accomplished by means of a simple torque arm on the non-driven shaft, the arm being held against rotation by a pivoted cantilever which will eventually carry strain gauges to enable torque to be recorded. The cantilever is held in the stop position by a solenoid-operated latch. The solenoid can be energized automatically at any pre-determined "burn off" distance.

The solenoid control circuit also trips the motor and operates the air valves, allowing the maximum force of the air cylinder to be applied to the workpiece.

A simple beam is interposed between the cylinder push rod and the moving work head; this will eventually carry strain gauges so that friction and upset forces can be recorded.

Obituary

Dr. E. Hammond

WE regret to record the death of Dr. E. Hammond, B.Sc., Ph.D., A.R.I.C., M.Inst.F., technical manager of Lafarge Aluminous Cement Co. Ltd.

Lord McGowan

IT is with regret we record the death of Lord McGowan, honorary President and former chairman of Imperial Chemical Industries Limited. He began his career with Nobel Explosives Company and became managing director in 1918. In that year, too, he received his K.B.E. Together with Sir Alfred Mond (later Lord Melchett), he united his own company with Brunner, Mond to form Imperial Chemical Industries Limited in 1925. He was created 1st Baron of Ardeer in 1937 and retired from business in 1950. He received honorary degrees from the Universities of Glasgow, Birmingham, St. Andrews, Durham and Oxford. He was a former President of the Society of Chemical Industry.

Mr. L. B. Robinson

WE also regretfully record the death of Mr. Lyell Bryant Robinson, chairman of Consolidated Zinc Corporation Ltd. and of Broken Hill Corporation Ltd. He was also a director of British Aluminium Co. Ltd. and of Société Generale Metallurgique de Hoboken S.A.

Mr. G. E. Sandland

WITH deep regret we record the death of Mr. George Sandland, whose activities in the plating industry on behalf of The Mond Nickel Co., now The International Nickel Co. (Mond) Ltd., were widely known. He had been with the company for 35 years.

During the war he worked in the development and research department, later rejoining the publicity department.

OUT OF THE MELTING POT

Pendulum Mill

IN the planetary type of rolling mill developed some years ago, the advantageous conditions for the deformation of the material being rolled arising from the use of rolls of small diameter were fully exploited. Normally, the use of small-diameter work-rolls is hampered by the extent of backing-up required to prevent deflection of the rolls. Various more or less complicated multiple-roll mill designs have been evolved to achieve this. There still remained the need to arrange for a number of passes of the material either through one and the same mill or through successive mills. In the planetary mill, the required number of "passes" between small-diameter work-rolls was achieved with a single pass through a single stand, by providing a large number of small-diameter work-rolls suitably mounted around the periphery of two co-operating large-diameter rolls. Rotation of the latter brought successive pairs of co-operating work-rolls into the roll gap to perform a certain amount of deformation on the metal being rolled, after which they were carried away from the pass line by the continuing rotation of the carrier rolls. In principle, the same effect of a succession of small deformations between a pair of small-diameter work-rolls could be achieved by using a single pair of such rolls and moving them backwards and forwards, instead of unidirectionally as in the planetary mill. This principle has now been embodied in a pendulum mill in which freely-rotatable work-rolls are mounted on the free ends of a pair of oppositely directed swingable arms or pendulums. These are arranged in such a way that, during their synchronized swinging movements, their free ends, each carrying a work-roll, approach one another so as to enable the work-rolls to act upon the slab, plate or strip which is progressively moved between them. The mechanically driven swinging arms are mounted in eccentric mountings by means of which the distance between the rolls at the point of their closest approach (i.e. at the roll gap) can be varied. This variation is controlled so that the rolls effect some reduction of the metal only on their forward swing in the direction opposite to that of the movement of the metal, and no deformation is effected on the return swing, the separation of the rolls being, if necessary, increased for this purpose.

No Ends

SCIENCE may well have an endless frontier, and scientific research may well go on exploring it for ever. Whatever the long-term implications of this may be, some of its current consequences undoubtedly call for a little more attention. One of these consequences is the tendency for this general endlessness to become transferred and attach itself to any particular bit of research which is then liable to drag on, if not for ever, then certainly for much too long. The same impression is obtained from the literature. All the research that is to be published is duly written up in the approved manner. How much research that is intended for publication is eventually written off? That practically no research is ever treated in this manner is, of course, due to this background idea of the endlessness of scientific progress. This gives rise to a feeling that writing off research would be unscientific. All the research on cermets, for example, may have been carried out, written up and published. All the promising combinations may have been tried. All their not particularly promising properties may have been determined, and all their few and unlikely applications may have been considered. So far, however, work on cermets has not been written off. That work on them has been largely discontinued can be inferred from the marked drop in the amount of research that is being written up. But for all the *conclusions* that have been drawn, the prospects may still be endless and break-throughs still to be expected in the future. However, if perhaps it is tacitly agreed that this particular future is very remote, the need for a write-off might face-savingly be waived.

Gas-Protected Refractories

NECESSITY may become the mother of an invention. More often, it may just lead to an uninspired plod in one well-trodden direction. The need for refractory materials resistant to aggressive melts at high temperatures provides examples of both. For aggressive molten metals, fluxes, salts, and the like, the choice of certain types of refractories, water-cooled metal "crucibles" for arc melting, and finally, where possible, the use of graphite as a container material are well-known and well tried, but have known unavoidable limitations. Where the choice is restricted for reasons of material, construction, etc., and one is therefore faced with a situation in which an aggressive melt at a high temperature is in contact with a permeable refractory material, the resistance of which to the melt leaves something to be desired, the consequences are likewise well-known and unfortunate. The melt penetrates into the pores of the refractory, a large surface area of which is thereby exposed to attack, which usually leads to fairly rapid distintegration of the refractory and a need for periodic patching or replacing of the lining. In these circumstances, the inventive approach has visualized the use of a suitable inert gas, which does not react with the melt, for the protection of the refractory material. The gas is introduced into the pores of the material under a slight pressure which operates in a direction such that the gas flows through the pores of the material towards the surface which is in contact with the melt. The pressure should be sufficient to cause the evolution of bubbles of the gas from this surface. The melt is thereby prevented from penetrating into the pores. The attack by the melt is consequently limited to the exposed wall surface and is thereby greatly reduced. Methods of putting the above idea into practice will depend on the circumstances of each particular case, and should present no difficulties to those "skilled in the art". There is also the further possibility of arranging for the inert gas to protect the surface of the melt by enclosing the melting space, and of an arrangement for withdrawing the gas from above the melt and recirculating it through the porous refractory. A particular application of the idea is to vessels and linings of magnesium oxide, especially those used in the production of aluminium by fused salt electrolysis.

Skimmer

Industrial News *Home and Overseas*

Aluminium Alloy from Stock

A marketing development likely to be of significance to many engaged in the production of repetition machined parts is the recent decision by **Aston Aluminium Warehouses Limited,** of Birmingham, to hold stocks of Noral 28S machining alloy. This material, previously available only to order and unobtainable off the shelf, is an aluminium alloy manufactured by **Alcan Industries Limited** specifically as screw machine stock. It has machining characteristics very similar to those of free-machining brass, and its advantages—particularly in price—have made it a commonly-used material for many small parts produced on automatic machines.

Apart from its high-speed machining qualities, Noral 28S has the merit of costing, volume-for-volume, little more than half as much as brass. Stocks now held take the form of machining rod from $\frac{1}{16}$ in. to 2 in. diameter, and increases in this size range are planned for the near future.

New Service Department

As a result of the opening of a fully equipped service department at their Walsall offices, **Fielden Electronics Limited** announce that they are now able to offer better after sales service to their customers in the Midlands area.

Exhibiting in India

A large commercial display of British products has been arranged by the Board of Trade at the **Indian Industries Fair** which opens in New Delhi on November 14 this year. Among the British firms represented will be: W. Canning and Co. Ltd., Solartron Electronic Group Ltd., Associated Electrical Industries Ltd., British Oxygen Co. Ltd., Wellman Smith Owen Engineering Corporation, Dowty Group Ltd., Smiths Aircraft Instruments Ltd., English Electric Co. Ltd., and Imperial Chemical Industries Ltd.

Chilean Copper News

A Bill for the creation of a Copper Corporation, which would take over world marketing of all Chilean copper, is to be presented to Parliament by the Christian Democratic Party, according to unconfirmed reports circulating in political circles in Santiago. Last week, the Chilean Communist Party submitted to Parliament a Bill which would require all copper-producing companies in Chile to refine their total production in the country.

A project for the construction of a copper refinery at Chanaral to process El Salvador blister output plus another 20,000 tons from other sources, was made known to Dr. Enrique Serrano, the Mining Minister, by Mr. Rodolfo Mitchels, Vice-President of the Anaconda Company's subsidiary, Andes Copper. Mr. Mitchel's statement added that in addition to the investment in the refinery—the amount of which was not disclosed—Chile Exploration, another Anaconda subsidiary, would invest $9,000,000 to increase output of the Chuquicamata mines by 10 per cent.

Copper in Jordan

It has been announced by the Jordan Economy Ministry that with the co-operation of German geologists copper ores have been discovered in Khsheibeh, near Wadi Araba, southern Jordan. The quantity of copper ores discovered is estimated at 22,500,000 tons.

Colliery Year Book

A new edition (1961) of the **Colliery Year Book and Coal Trades Directory** has just been published. This edition has been comprehensively revised and supplemented where necessary, to ensure that it is completely up-to-date. Particularly to be noted is the addition of all the latest amendments to the Mines Regulations.

The book covers 916 pages and is cloth bound. Price is 45s. net (by post 46s. 9d.) and is published by Iliffe Books Limited.

Electroplating Data Sheets

News from **Johnson, Matthey and Company Limited** is that they have issued the first data sheets on a revised and enlarged series describing products for the electrodeposition of the noble metals: silver, gold, palladium, rhodium and platinum.

Sheets issued deal with the types of high-purity silver anodes available for vat and barrel plating under a wide range of conditions. The Acid Hard Gold method of plating printed circuits, bright gold plating, and the Galvoric immersion process for decorative uses are covered, and also palladium plating and the recently introduced DNS platinum process, which produces bright, heavy, and coherent deposits.

Data sheets in preparation will give details of new rhodium plating methods and the well-established range of Johnson, Matthey gold and silver salts. Sets of the electroplating data sheets are obtainable from the company.

Dealing with Dust

Specializing in the design and manufacture of dust control equipment for industry using wet and dry methods of collection, **Dallow Lambert and Company Ltd.** will be showing at the forthcoming International Heating, Ventilating and Air Conditioning Exhibition to be held at Olympia, in London, in September-October next.

Full scale equipment will be displayed under operating conditions, and will include an entirely new collector embodying unusual features, several "Unimaster" dust control units of latest type, and an MG30 wet deduster. Varied applications of the company's equipment will be portrayed in photographs.

Irish Duty on Aluminium

An announcement from the Irish Republic Revenue Commissioners states that the Government have made an Order entitled the Imposition of Duties (Aluminium Sheet, Strip and Foil) Order 1961. This Order provides for the continued suspension of the customs duty at Tariff Ref. 2/2 (Aluminium sheet, strip and foil), during the period July 1, 1961, to December 31, 1962, inclusive in so far as it applies to:

(a) sheet, strip or foil which is made wholly or mainly of aluminium or of an alloy of which aluminium is the main constitutent and exceeds one-fiftieth of an inch in thickness,

(b) articles consisting of articles chargeable with the said duty and mentioned at (a) which are combined by adhesion with a layer or layers of paper or any other material, and

(c) pieces of the articles chargeable with the said duty and mentioned at (a) or (b) which are cut to shape or size, other than pieces of circular or approximately circular shape, the greatest cross-sectional diameter of which does not exceed 25 in.

Light Alloy Water Tender

Light alloys are being used in the construction of fire-fighting appliances by **Alf'd Miles Ltd.** A powerfully efficient water tender, engineered by Miles in high grade top strength aluminium alloy, was recently added to the strength of the fire section of a leading firm of shipbuilders. Light alloy is also used by Miles, a member of the Hawker Siddeley Group, in the manufacture of a forward controlled Landrover "B" type fire appliance, crash tenders and other fire-fighting vehicles, as well at tankers and lighting columns.

News from Birmingham

Little change is noticeable in Midland industry. The motor trade is back to normal and its requirements in the matter of raw materials and components find work for many thousands in the area. Some engineering firms are still having difficulty in getting sufficient labour, especially skilled and semi-skilled. Light engineering firms continue very active. Export trade shows no marked increase as far as metals are concerned, but imports have declined in the first half year. The building industry continues to boom, and prospects are good for the next few months.

Demand for heavy steel remains good. There is a big consumption of structural steel by engineering contractors. Exports of steel have shown a rise in the last month. Substantial tonnages of steel sheets are being used in the motor trade, but deliveries will be curtailed with the approach of the holiday season, now only a week ahead. Makers of light castings have moderate order books but demand for heavy castings is well maintained. The output of basic iron is readily absorbed by steelmakers, but the production of foundry iron is in excess of requirements.

An Acquisition

Information from **Hilger and Watts Limited** is to the effect that they have acquired the whole of the issued share capital of Microwave Instruments Ltd. Mr. J. Bilbrough, A.M.Brit.I.R.E., will continue to be managing director of the latter company. The two companies have been collaborating for over a year on the development of measuring apparatus for electron spin resonance.

Works Accident Statistics

In 1960, there were no less than 190,266 industrial accidents which were serious enough to necessitate their being reported to the Factory Inspectorate. There were very many more which were, fortuitously, of a less serious nature.

If management is to be able to deal effectively with this problem, it must be known when, where, why and how accidents are occurring to its employees. That means records—accurate records. How best to establish a satisfactory

accident recording system, how to prepare statistics from those records, and how to present them in a clear and concise manner, are matters which may present some difficulty without adequate guidance.

The Royal Society for the Prevention of Accidents has now published "Works Accident Statistics, Part 2: Records and Analysis", which is a comprehensive and exclusive pamphlet which no industrial safety officer or other person responsible for accident prevention work in industry should be without. The price of this pamphlet is 5s. post free.

U.K. Metal Stocks

Stocks of refined tin in London Metal Exchange official warehouses at the end of last week fell 305 tons to 6,485 tons, comprising London, 3,346, Liverpool 1,995 and Hull, 1,144.

Copper stocks rose 100 tons to 19,977, distributed as follows: London 450, Liverpool 16,002, Birmingham 50, Manchester 3,400, Hull 50 and Glasgow 25.

Lead duty-free stocks rose 185 tons to 9,325 tons comprising London 8,971, Glasgow 104 and Swansea 250. In-bond stocks were unchanged at 3,743, all in London.

Zinc duty-free stocks rose 133 tons to 4,336, comprising London 3,338, Glasgow 106, Manchester 400 and Liverpool 492. In-bond stocks fell 50 tons to 2,473 (all in London).

Aluminium in Japan

It is reported from Tokyo that the Japan Light Metal Company, a Japanese producer of primary aluminium, has asked a United States underwriter for a loan of 10,000,000 U.S. dollars. The request had been made through the Industrial Bank of Japan, and the funds would be used for the construction of a new aluminium refinery, using overseas techniques, the company said. Construction would begin in 1963 in central Japan, and the refinery would have an initial capacity of 25,000 tons a year, it added.

Malayan Tin Industry

In an interview given in Kuala Lumpur this week, Mr. Lee, the retiring chief inspector of mines, said that Malaya's tin industry had passed its peak and was unlikely ever again to reach the post-war record of 62,300 tons produced in 1956. He said that there were now 626 mines in operation, against 1,033 in 1940. Production had dropped from 80,000 tons (the highest ever) in 1940 to 52,000 tons last year.

Even if the present level was to be maintained, every effort would be needed and all available land would have to be worked, he said. The future of the industry depended largely on the ability to work ground of ever-decreasing grade. Costs would have to be reduced, and this could be done by improved technique, he added.

New Subsidiary

It has been announced by the board of the **Glacier Metal Co. Ltd.** that arrangements are well advanced for the formation of a subsidiary in South Africa which will manufacture plain bearings for that market

Glacier will hold the major proportion of the equity capital—initially to be about £50,000 total—and South African interests the remainder. Production is expected to start in nine to twelve months from now.

Copper at Olympia

At the forthcoming Heating, Ventilating and Air Conditioning Exhibition, to be held in London late in September this year, the display to be made by the **Copper Development Association** will draw attention to the essential role played by copper and its alloys in so many applications. Emphasis, however, will be upon the many forms of copper and copper-alloy tubes. In particular, a display arrangement of small-bore copper tube for use in radiant panel heating installations will provide a fitting accompaniment to the recently announced publication of a new C.D.A. book covering this subject in considerable detail. For similar reasons, copper electric cable for use in floor, ceiling or wall radiant panel heating will also be featured. In addition, typical copper-alloy tubing for heat exchangers, condensers or similar applications will also be shown. Visitors to the stand may inspect the wide range of C.D.A. publications, any of which may be obtained free upon application, whilst members of the C.D.A. staff will be in attendance to provide information and advice on all matters appertaining to the use of copper and its alloys.

A Golf Tournament

Moseley Golf Club, Birmingham, was the venue for the second annual golf tournament of the **Delta Metal Company Limited,** held earlier this month. In the morning round (medal) for the Ogden cup, given by Mr. W. E. Ogden, chairman of the Delta group, the winner was Mr. H. Moseley (E. P. Jenks Ltd.) with 67 net (16 handicap).

The afternoon round (fourball) for the Dolton cup, given by Mr. W. W. Dolton, group managing director of Delta, was won by A. H. Meese (Sanbra Ltd.) and Mr. T. W. Burnett. The presentation of the cups and prizes was made by Mr. W. J. Vaughton, deputy managing director of the company.

At the Delta Golf Tournament: (l. to r.) Mr. W. J. Vaughton, deputy managing director of the Delta Metal Company Ltd., presenting the "W. W. Dolton Cup" to the doubles winners, A. H. Meese and T. W. Burnett

Road Transport Law

A summary of the legislation affecting the construction, equipment and use of motor vehicles is published annually by Iliffe Books Ltd. The new edition (1961) has been completely revised to incorporate all the references to the 1960 Road Traffic Act as well as to the numerous changes in legislation that have taken place since the previous edition was published.

The purpose of this book is to enable the layman to understand easily the various Acts and Regulations affecting the construction and operation of vehicles. The legislation is presented in a summarized form, but should it be necessary to consult any particular Act, Regulation or Order, the official titles are given in the special system of references.

The book contains 142 pages and the published price is 15s. net, plus 10d. by post.

Summer School

In conjunction with the Corrosion Group of the Society of Chemical Industry, the Metallurgy Department of the **Battersea College of Technology** has organized its eighth summer school on corrosion, the theme on this occasion being "Corrosion Problems in the Electrical Power Industry".

The course is being held from September 25 to 28 next, and will deal with corrosion as it affects each stage in the generation of electrical power. The fee for the course (inclusive of luncheon, morning and afternoon refreshment) is £10, and enrolment forms may be obtained from the Secretary (Summer School), Battersea College of Technology, London, S.W.11.

Temperature Controller

A new mercury-in-steel, on-off temperature controller, which has independent circuits allowing control at any two points through one instrument, has been produced by the **British Rototherm Co. Ltd.** Each of the two controller circuits consists of alloy steel Bourdon tubes, capillaries and temperature sensitive bulbs, operating mercury switches rated up to 30 amp. at 230-250 A.C. The differential is fixed but varies according to switching capacity.

Indicator lamps and bottom entry electrical conduit are standard. Temperature ranges are available between −20°F. and +1,000°F. (minimum coverage 100°F.) and the equivalent °C. The case is aluminium alloy and the standard capillaries 10 ft. copper sheathed with mild steel bulbs screwed ½ in. B.S.P. This temperature controller is Model No. 1039.

Malayan Tin Shipments

Exports of refined tin from Penang and Singapore in the first half of July totalled 2,521¼ tons against 2,885¼ in the corresponding period of June, the Straits Trading Company announced. Of the first half of July exports, the United States took 702 tons, the Continent 645, Canada 105, Japan 629, the Pacific 18¼, India 220½, South America 96¼, Africa 20, Australasia 75, and the Middle East 10¼ tons.

Tin shipments in the first half of July totalled 2,321½ tons from Penang and

200½ tons from Singapore, according to the Straits Trading Company. The Penang total comprised 652 tons to the United States, 515 to the Continent, 105 Canada, 629 Japan, 18½ Pacific, 220½ India, 96½ South America, 75 Australasia and 10½ Middle East. The Singapore total comprised 50 tons to the United States, 130 to the Continent, a quarter of a ton to the Pacific and 20 to Africa.

British Oxygen News

Eight steel trunnion pins, each over 2 ft. across, were nitrogen shrunk to fit four 100-ton ladles recently at the Teesdale Ironworks of **Head Wrightson and Co. Ltd.** To fit the ladle bores, the diameter of the pins was shrunk by an average of 0·04 in. A light, insulated tank, 2 ft. deep, was made to hold the liquid nitrogen supplied by **British Oxygen.** The tank could be moved on rails above the ladles, which were set up on bogies.

By means of a two-ton electric hoist, each pin was lined up with the ladle bore and then raised while the liquid nitrogen tank was positioned underneath. The pin was lowered into the tank and immersed in liquid nitrogen pumped direct from a B.O.C. road tanker. On average, each pin was immersed for about 52 min. A total of 1,232 gal. of liquid nitrogen was used.

Nitrogen shrinking was stated to be the most economical and only practical way of fitting the trunnions. Heating the ladle bore would have been much more difficult and costly, and taken a great deal longer. In addition, the metal might have been distorted and weakened.

Symposium on Corrosion

Organized by the Société de Chimie Industrielle, a Symposium on Corrosion in the Nuclear Energy Industry is to be held in Paris in October next. The programme, which has been completed by a scientific committtee, is to be particularly concerned with corrosion in sheath materials. It forms the 16th manifestation of the European Federation of Corrosion. Full details of the programme and forms of application may be obtained from the Société, at 28 rue Saint-Dominique, Paris (7e).

Waste Flue Gases

A new publication from the **Incandescent Heat Company Limited** deals with "High purity CO_2 from waste flue gases". The text is accompanied by a simplified flow diagram of a typical CO_2 recovery plant as produced by the company. There is also an illustration of a complete recovery plant of medium size.

Katanga Copper Exports

According to a report from Brussels, Katanga's copper exports in the year ended June 30 totalled 275,000 metric tons worth 8,000,000,000 Belgian francs. Katanga also exported 415,000 tons of various other minerals worth 2,500,000,000 Belgian francs during the same period. No comparisons are available for the previous year.

Copper in Bolivia

A five-man mission of the Mitsubishi Metal Mining Company Limited, a leading Japanese mining firm, has left Tokyo to conduct a survey of the Carangas copper mines in Bolivia. It said the mines deposits were estimated at 13,000,000 tons and the ore was reported to have a 4 per cent copper content. After the size of the deposits had been ascertained, Mitsubishi Metal was planning to discuss exploitation methods with the owners, the announcement added.

Electric Furnaces

An order has been received by **Wild-Barfield Electric Furnaces Ltd.** from the Austin Motor Company for the supply of a number of electric furnaces for hardening and refining shackle spring pins and other parts.

The installation will comprise a PCF.2 (H) pan conveyor furnace capable of treating up to 250 lb/hr. of work in pans measuring 16 in × 4 in × 2 in.; 72 charge pans will be provided, and a feature of the furnace is that once pans are discharged they are automatically returned to the loading end. The furnace itself will have a maximum operating temperature of 950°C. and a total rating of 56 kW divided into two zones of 41 kW and 15 kW. A water quench tank will be provided having an impeller type agitator and a continuous belt type extractor.

In addition, two standard gas carburizing furnaces, model GC.3624, will be supplied. These are top fan type equipments having a maximum operating temperature of 1,000°C. Heating is provided by coiled elements of nickel chromium alloy giving a maximum rating of 120 kW. This input, however, can be reduced by suitable switching to 40 kW, the latter being adequate, once temperature has been attained, to maintain a pre-set level over long periods. To cut down the overall treatment cycle, accelerated cooling ducts are incorporated in the furnace, permitting cold air to pass between the furnace elements and the outer surface of the retort. The carburizing atmosphere will be derived from "Carbodrip".

For tempering and any other work requiring a maximum operating temperature of 700°C., a forced air circulation furnace model 3660C will be supplied. This equipment has nominal charge space

Metal Statistics

Detailed figures of the consumption and output of non-ferrous metals for the month of May, 1961 have been issued by the British Bureau of Non-Ferrous Metal Statistics, as follows in long tons:—

COPPER	Gross Weight	Copper Content
Wire	23,583	23,120
Rods, bars and sections	15,970	10,409
Sheet, strip and plate	12,886	10,276
Tubes	8,094	7,456
Castings and miscellaneous	7,772	—
Sulphate	3,652	—
	71,957	58,522
Of which:		
Consumption of Virgin Copper		44,083
Consumption of Copper and Alloy Scrap (Copper Content)		14,439

LEAD	
Cables	7,955
Batteries	2,525
Battery Oxides	2,818
Tetra Ethyl Lead	2,279
Other Oxides and Compounds	2,204
White Lead	685
Shot	529
Sheet and Pipe	6,230
Foil and Collapsible Tubes	402
Other Rolled and Extruded	561
Solder	1,456
Alloys	1,739
Miscellaneous Uses	1,734
Total	31,117

TIN	
Tinplate	791
Tinning:	
Copper Wire	51
Steel Wire	9
All other	76
Solder	144
Alloys	532
Foil and Collapsible Tubes, etc.	47
Tin Compounds, Salts, and Miscellaneous Uses	157
Total Consumption	1,807

ZINC	
Galvanising	8,819
Brass	9,917
Rolled Zinc	2,517
Zinc Oxide	2,291
Zinc Die-casting alloy	4,730
Zinc Dust	938
Miscellaneous Uses	873
Total, All Trades	30,085
Of which:	
High purity 99·99 per cent	5,114
Electrolytic and high grade 99·95 per cent	4,840
Prime Western, G.O.B. and debased	12,574
Remelted	345
Scrap Brass and other Cu alloys	4,391
Scrap Zinc, alloys and residues	2,599

ANTIMONY	
Batteries	127
Other Antimonial Lead	50
Bearings	22
Oxides—for White Pigments	129
Oxides—other	83
Miscellaneous Uses	18
Sulphides	3
Total Consumption	432
Antimony in scrap	
For Antimonial Lead	506
For Other Uses	37
Total Consumption	543

CADMIUM	
Plating Anodes	53·40
Plating Salts	7·20
Alloys: Cadmium Copper	4·00
Alloys: Other	2·65
Batteries: Alkaline	5·00
Batteries: Dry	0·40
Solder	6·55
Colours	21·80
Miscellaneous Uses	1·80
Total Consumption	102·80

dimensions 30 in. dia × 60 in. deep and will be fitted with a vertically lifting hydraulically operated door.

Southern Rhodesian Production

According to figures issued by the Department of Mines, Southern Rhodesia produced 1,145 tons of copper during May this year, compared with 982·34 tons in April and 2,288 tons in May, 1960. Production during the first five months of the current year totalled 5,232 tons, against 5,657 tons during the corresponding period in 1960.

During May, Southern Rhodesia produced 6,819 fine oz. of silver, compared with 7,992 oz. in April, and 62,912 oz. in May 1960. The accumulated total for the first five months of the current year was 57,415 oz., compared with 158,992 oz. in the corresponding period a year ago.

Southern Rhodesia produced 7·55 tons of tin concentrates in May this year, against 5·53 tons during April, and 4·08 tons in May, 1960, figures issued by the Department of Mines reveal. The total output for the first five months of the current year amounted to 30·28 tons, against 21·71 tons in the corresponding period in 1960. Tin metal production in May was 66·39 tons, against 69·84 tons in April, and 125·36 tons in May 1960. Production during the January-May period this year amounted to 305·77 tons, against 298·86 tons in 1960.

Change of Address

As from Monday next, July 24, the address of **Unicam Instruments Ltd.** will be at York Street, Cambridge, with the telephone number of Cambridge 55227.

Gas Cleaning Cyclones

From the development work that has been conducted in connection with their established gas cleaning equipment, wet dry plate and tube precipitators, **Head, Wrightson and Company Ltd.** are now in a position to offer a full range of high performance cyclone separators, varying from standard units to "tailor-made" separators for special applications.

Details of this type of equipment are given in a twelve-page booklet, together with a number of illustrations and diagrams. Copies of the booklet may be obtained from the company.

The Pickling Process

A new publication covering the selection of the most efficient materials for use in the handling equipment of the pickling process has been produced by **Henry Wiggin and Company Limited.** Hot-working or other thermal treatment on metals frequently results in the formation of a surface layer of oxide, the removal of this layer by immersion in an acid or alkali solution being known as "pickling".

The work to be pickled must be suspended in the solution in such a manner as to allow the acid or alkali free access to all surfaces, and the handling equipment must resist the corrosive attack of the pickling liquors. The choice of material for the equipment and its design are the two aspects of the process on which this publication offers advice. The publication is illustrated and contains many working drawings.

Non-Ferrous Metals in India

Speaking in Calcutta recently, Mr. Manubhai Shah, India's Minister for Industry, disclosed that the Government would shortly set up an expert study group for the procurement, development and substitution of non-ferrous metals in the country. Inaugurating the annual general meeting of the Indian Non-Ferrous Metal Association, Mr. Shah said development of the non-ferrous metals industry was most vital because on it depended the development of all basic industries in the country. For this purpose the Government had already established another smelter in the public sector which, in the first phase, would have a capacity of 25,000 tons and later, in the second phase, 50,000 tons. This was in addition to three other smelters in the private sector.

Mr. Shah laid particular stress on the substitution of non-ferrous metals. Aluminium, which was easily available, could be substituted on a liberal scale for copper as this metal was in short supply. This method was employed widely in many highly advanced countries with admirable results, he said. They could effect a saving of up to 50 per cent if they resorted to substitution of aluminium wherever technologically feasible.

Company Reports

The Mint, Birmingham

Net profit, year to March 31, 1961, £70,596 (£38,138), dividend 15 per cent (12½ per cent) and proposed 1-for-2 scrip issue. Current assets £529,006 (£508,669) and liabilities £151,811 (£198,181).

Keith Blackman Ltd.

Group net profit, year to March 31, 1961, £123,456 (£122,410) and dividend 17½ per cent (same). Fixed assets £357,415 (£377,199) and net current assets £1,596,100 (£1,518,248). Commitments £95,000 (£8,250).

Birmid Industries

It has been reported that Birmid Industries has agreed to purchase the capital of Sterling Foundry Specialities for £533,460 cash. The Board of Birmid is satisfied that substantial trading and financial benefits will accrue from the acquisition.

Capper Pass and Son

Second interim dividend 3 per cent and final 3 per cent, making 10 per cent for the year ended March 31, 1961 (same). Group profit £143,264 (£202,463), after tax £144,155 (£212,623). Preference dividends £18,927 net (same). Ordinary £74,763 (same). The profit has been increased by £12,817 provision of loss on investment no longer required and £13,184 profit on sales of subsidiaries, land and buildings. After eliminating the effect of stock valuation variations in metal prices, the directors calculate that the true smelting and trading profits of 1960-61 was £267,000 compared with £287,000 in 1959-60.

Trade Publications

Nitrogen and Hydrogen Plants. — The Incandescent Heat Company Limited, Cornwall Road, Smethwick, Birmingham.

The gas atmospheres division of this company has produced this eight-page brochure, which deals with the range of gas purifying equipment which has been developed, including dryers for air and all gases, endothermic gas generators, large scale carbon dioxide plants and desulphurizing equipment.

Impalco Aluminium. — Imperial Aluminium Company Limited, P.O. Box 216, Witton, Birmingham, 6.

This brochure deals with "Tube-in-strip", which is a single piece of aluminium providing a combination of parallel tubes and strip material. Applications and other details of this product are given, with several illustrations.

Bright Bar Protective. — Croda Limited, Cowick Hall, Snaith, Goole, Yorks.

A technical data sheet deals with "Gelanol", a composition which was formulated for application to bright drawn bar, rod, etc. The composition and properties are listed, its function, manipulation and uses detailed.

Electric Furnace Technique. — The Morgan Crucible Group, Battersea Church Road, London, S.W.11.

A twelve-page brochure describes the Morgan "Crusilite", a self-bonded silicon carbide element material. The brochure details new possibilties in the design and construction of furnaces for many purposes, particularly for high temperature electrical furnaces in the metal industries. Setting out the advantages, its applications and characteristics, the brochure also contains illustrations and diagrams.

New Companies

The particulars of companies recently registered are quoted from the daily register compiled by Jordan and Sons Limited, Company Registration Agents, Chancery Lane, W.C.2.

Rutland Metals (Associates) Limited (693885), 69 Wimpole Street, W.1. Registered May 29, 1961. Nominal capital, £1,000 in £1 shares. Directors: Geo. W. Barker and Lily K. Barker.

M.S. (Electro-Plating) Limited (694317), 713 Imperial House, Kingsway, W.C.2. Registered June 2, 1961. Nominal capital, £100 in £1 shares. Directors: Montague Smith and Harry Portugal.

C. T. Digby and Sons Limited (694601), Nicol Road, Chalfont St. Peter, Bucks. Registered June 5, 1961. To undertake welding and metal fabrications, metal machinery, metal and paint spraying, etc. Nominal capital, £100 in £1 shares. Directors: Charles T. Digby and Kathleen P. E. Digby.

Shapley and Smith Limited (694001), 10 Grays Inn Square, W.C.1. Registered May 30, 1961. To carry on business of enamellers, stove enamellers, paint sprayers, etc. Nominal capital, £1,000 in £1 shares. Directors: Norman V. Smith and Joan D. Smith.

Metal Market News

ALTHOUGH trading on the Metal Exchange was active last week, sentiment was rather depressed and in tin and copper, at any rate, losses were registered on balance. In lead and zinc, the course of prices was fully steady and there was even a modest improvement in values by the end of the week. The doubts and fears regarding the country's economic situation, which did so much damage to quotations on the Stock Exchange, did not appear to be responsible for the weakness in copper and tin, which was probably due primarily to the absence of consumer demand for both these metals. Stocks of copper in Metal Exchange warehouses again increased by 550 tons to 19,877 tons, and so long as trade demand remains poor it must be expected that this upward trend will continue. In consequence of the high stocks and rising tendency the contango has remained wide, and on Thursday midday it stood at £5. This, however, was not maintained on the afternoon market, and it seems to have been due probably to a bout of selling of cash and early dates. In view of the cost of financing copper and holding it in warehouse, a carrying rate of £4, or even more, does not seem excessive.

In the early part of the week, the copper market firmed up on a report of threatened trouble of one kind and another at Noranda, Chile, in the Congo and in Rhodesia. However, later in the week it appeared after all unlikely that a general strike would be resorted to in Rhodesia, and prices eased off. The Noranda dispute is still in the future, while in Chile, also, the threat of a swing to some sort of nationalizing of the copper industry is certainly not imminent. Undoubtedly, the main trouble with the market at present is lack of interest by the users and this is hardly likely to come right just yet. It is, of course, always possible that a sharp drop to £225 or lower might tempt buyers to put metal on their books but, apparently, the ultimate users of copper are not showing much interest. The holiday season is now upon us, and quiet weeks lie ahead. Excluding Kerb business, the turnover in copper last week amounted to about 11,500 tons, both positions losing £2 5s. 0d. to close at £227 15s. 0d. for cash and £232 three months. Although no change occurred in the U.S. producers' price, a downward trend developed on Comex, which followed Whittington Avenue. Towards the end of the week, however, a steadier trend appeared.

Stocks of tin in Metal Exchange warehouses fell by 230 tons to 6,790 tons, and it must be presumed that this downward trend will continue. On the market, dealing was much quieter than of late, and Friday's turnover was reported as the lowest for six weeks. In total, some 1,150 tons changed hands during the week and the price of cash fell by £4 to £912. Three months, however, was unchanged at £923 10s. 0d., so that the contango now amounts to £11 10s. 0d. Reports in circulation suggested that a decision by the U.S. Government regarding the disposal of the 4,000 tons of tin ex the Texas Smelter was imminent. Metal Exchange stocks of lead advanced from 11,468 tons to 12,883 tons, and on a turnover of 10,800 tons cash closed 15s. up at £65 and forward 10s. better at £66 5s. 0d. Zinc stocks were 166 tons down at 6,726 tons, and the market improved by 5s. to £77 15s. 0d. and £78 17s. 6d. on a turnover of 7,650 tons.

New York

Copper futures were firmer on covering and new buying, reflecting the Electrical Workers' Union's rejection of the Kennecott's contract offer which had been accepted recently by the Mine Mill Workers Union. Custom smelters and producers indicated satisfactory seasonal sales so far for August, a usual slow month. Scrap copper was steady and quiet. Tin was weaker, following the decline abroad. Modest solderer and dealer buying was noted. Lead was quiet. Prime western zinc business was fair. In late dealings, tin was quiet and steady. The other metals were unchanged.

The Commerce Department has issued licences to ship overseas millions of dollars worth of United States goods in the first half of July. But it followed the usual U.S. practice of strictly limiting the issuance of licences for American articles to move to the Soviet Union and Soviet Bloc countries in Eastern Europe.

These facts were disclosed today by a study of the lists of approved export licences issued by the Department daily for the nine business days in the first two weeks of July. These lists do not identify any exporters by name but give the description of the products licenced for shipment abroad, their value, and the country to which they are destined.

Publication of the lists of approved licences began on July 3 after Congressman John Moss, head of the influential House of Representatives subcommittee on Government operations, complained the department was withholding information vital to U.S. business interests.

Of the many thousands of export licences approved in the first half of this month, the study revealed a brisk demand from non-Communist countries of the world.

Some individual licences issued during July with a value of more than $1,000,000 were:

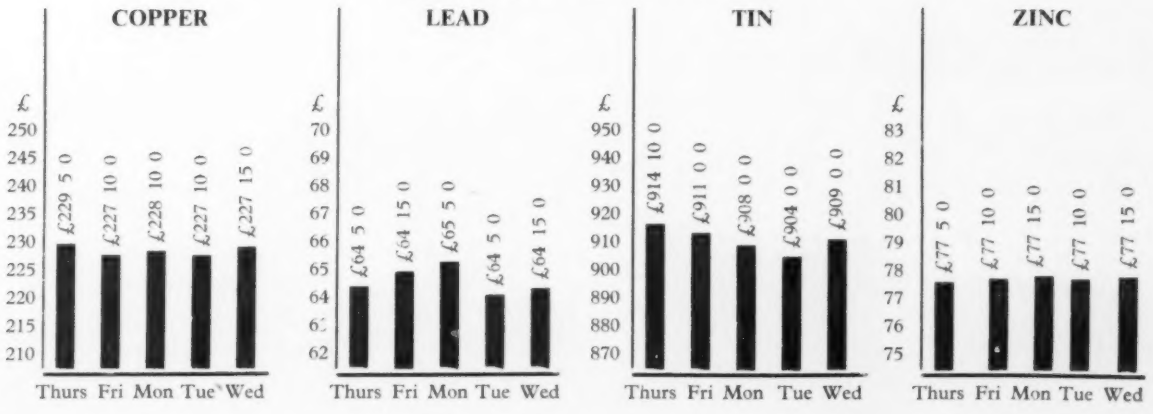
July 5—$2,304,000 worth of molybdenum concentrates for West Germany.

July 11—$2,001,600 of copper wire bars for the United Kingdom; and $1,237,167 of insulated copper cable for Saudi Arabia.

July 12—$2,016,000 of electrolytic copper for Japan.

London Metal Exchange

Thursday 13 July to Wednesday 19 July 1951



NON-FERROUS

PRIMARY METALS

All prices quoted are those available at 2 p.m. 19/7/61

		£	s.	d.
Aluminium Ingots	ton	186	0	0
Antimony 99·6%	„	237	10	0
Antimony Metal 99%	„	230	0	0
Antimony Oxide Commercial	„	194	10	0
Antimony White Oxide	„	212	0	0
Arsenic	„	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	„		11	0
Calcium	„	2	0	0
Cerium 99%	„	15	0	0
Chromium	„		6	11
Cobalt	„		12	0
Columbite per unit			8	10	0
Copper H.C. Electro	ton	227	15	0
Fire Refined 99·70%	„	226	0	0
Fire Refined 99·50%	„	225	0	0

		£	s.	d.
Copper Sulphate	ton	78	0	0
Germanium	grm.		—	
***Gold**	oz.	12	11	7½
Indium	„		10	0
Iridium	„	24	0	0
Lanthanum	grm.		15	0
Lead English	ton	64	15	0
Magnesium Ingots	lb.			
99·8%	„		2	2½
99·9+%	„		2	3
Notched Bar	„		2	9½
Powder Grade 4	„		5	6
Alloy Ingot, AZ91X		1	11½-2	1½
Manganese Metal	ton	280	0	0
Mercury	flask	66	0	0
Molybdenum	lb.	1	10	0
Nickel	ton	660	0	0
F. Shot	lb.		5	5
F. Ingot	„		5	6
Osmium	oz.	20	0	0
Osmiridium	„		—	

		£	s.	d.
Palladium	oz.	9	0	0
Platinum	„	30	5	0
Rhodium	„	46	0	0
Ruthenium	„	16	0	0
Selenium	lb.	2	6	6
Silicon 98%	ton	123	0	0
Silver Spot Bars	oz.		6	7⅛
Tellurium Sticks	lb.	2	0	0
Tin	ton	909	0	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	„		—	
Virgin Min 98%	„	78	6	3
Dust 95/97%	„	121	10	0
Dust 98/99%	„	128	10	0
Granulated 99+%	„	103	6	3
Granulated 99·99+%	„	115	13	9

**Duty and Carriage to customers' works for buyers' account.*

INGOT METALS

All prices quoted are those available at 2 p.m. 19/7/61

Aluminium Alloy (Virgin)		£	s.	d.
B.S. 1490 L.M.5	ton	210	0	0
B.S. 1490 L.M.6	„	202	0	0
B.S. 1490 L.M.7	„	216	0	0
B.S. 1490 L.M.8	„	203	0	0
B.S. 1490 L.M.9	„	203	0	0
B.S. 1490 L.M.10	„	221	0	0
B.S. 1490 L.M.11	„	215	0	0
B.S. 1490 L.M.12	„	223	0	0
B.S. 1490 L.M.13	„	216	0	0
B.S. 1490 L.M.14	„	224	0	0
B.S. 1490 L.M.15	„	210	0	0
B.S. 1490 L.M.16	„	206	0	0
B.S. 1490 L.M.18	„	203	0	0
B.S. 1490 L.M.22	„	210	0	0
Aluminium Alloys (Secondary)				
B.S. 1490 L.M.1	ton	155	0	0
B.S. 1490 L.M.2	„	153	0	0
B.S. 1490 L.M.4	„	163	0	0
B.S. 1490 L.M.6	„	176	0	0
***Aluminium Bronze**				
BSS 1400 AB.1	ton	244	0	0
BSS 1400 AB.2	„	252	0	0

***Brass**		£	s.	d.
BSS 1400-B3 65/35	ton	176	0	0
BSS 249	„		—	
BSS 1400-B6 85/15	„	220	0	0
***Gunmetal**				
R.C.H. 3/4% ton	„		—	
(85/5/5/5) LG2	„	217	0	0
(86/7/5/2) LG3	„	227	0	0
(88/10/2/1)	„	287	0	0
(88/10/2/½)	„	297	0	0
***Manganese Bronze**				
BSS 1400 HTB1	„	193	0	0
BSS 1400 HTB2	„	215	0	0
BSS 1400 HTB3	„	230	0	0
Nickel Silver				
Casting Quality 12%	„	260	0	0
„ „ 16%	„	270	0	0
„ „ 18%	„	310	0	0
***Phosphor Bronze**				
B.S.1400P.B.1.(A.I.D. released)	„	314	0	0
B.S. 1400 L.P.B.1	„	240	0	0

**Average prices for the last week-end.*

Phosphor Copper		£	s.	d.
10%	ton	259	0	0
15%	„	262	0	0
Phosphor Tin				
5%	„	995	0	0
Silicon Bronze				
BSS 1400-SB1	„	290	0	0
Solder, soft, BSS 219				
Grade C Tinmans	„	409	5	0
Grade D Plumbers	„	325	0	0
Grade M	„	451	10	0
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.		—	
Type 9 „	„		—	
Zinc Alloys				
BSS 1004 Alloy A	ton	109	3	9
BSS 1004 Alloy B	„	113	3	9
Sodium-Zinc	lb.		2	6½

SCRAP METALS

Merchants' average buying prices delivered, per ton, 18/7/61

Aluminium	£
New Cuttings	139
Old Rolled	104
Segregated Turnings	79
Brass	
Cuttings	160
Rod Ends	144
Heavy Yellow	137
Light	132
Rolled	147
Collected Scrap	134
Turnings	137

Copper	£
Wire	204
Firebox, cut up	202
Heavy	201
Light	198
Cuttings	209
Turnings	185
Braziery	166
Gunmetal	
Gear Wheels	198
Admiralty	198
Commercial	180
Turnings	175

Lead	£
Scrap	55
Nickel	
Cuttings	—
Anodes	591
Phosphor Bronze	
Scrap	180
Turnings	175
Zinc	
Remelted	70
Cuttings	64
Old Zinc	44

METAL PRICES

SEMI-FABRICATED PRODUCTS

Prices vary according to dimensions and quantities. The following are the basis prices for certain specific products

	£ s. d.
Aluminium	
Sheet 10 S.W.G. lb.	2 10½
Sheet 18 S.W.G. „	3 0½
Sheet 24 S.W.G. „	3 3½
Strip 10 S.W.G. „	2 10½
Strip 18 S.W.G. „	2 11½
Strip 24 S.W.G. „	3 1
Circles 22 S.W.G. „	3 4½
Circles 18 S.W.G. „	3 3½
Circles 12 S.W.G. „	3 2½
Plate as rolled „	2 10
Sections „	3 4
Wire 10 S.W.G. „	3 1½
Tubes 1 in. o.d. 16 S.W.G. „	4 4
Aluminium Alloys	
BS 1470. HS19W.	
Sheet 10 S.W.G. „	3 3
Sheet 18 S.W.G. „	3 5½
Sheet 24 S.W.G. „	4 1
Strip 10 S.W.G. „	3 3
Strip 18 S.W.G. „	3 4½
Strip 24 S.W.G. „	4 0½
BS1477. HP30M. Plate as rolled „	3 1
BS1470. HC15WP.	
Sheet 10 S.W.G. „	4 3
Sheet 18 S.W.G. „	4 8½
Sheet 24 S.W.G. „	5 8½
Strip 10 S.W.G. „	4 4
Strip 18 S.W.G. „	4 8½
Strip 24 S.W.G. „	5 4½

	£ s. d.
Aluminium Alloys—cont.	
BS1477. HPC15WP. Plate heat treated .... lb.	3 10½
BS1475. HG19W. Wire 10 S.W.G. „	4 2
BS1471. HT19WP. Tubes 1 in. o.d. 16 S.W.G. „	5 5
BS1476. HE19WP. Sections „	3 4
Split tube	
19 S.W.G. (⅛″) „	4 2
20 S.W.G. (⅜″) „	3 11
21 S.W.G. (⅜″) „	4 1
22 S.W.G. (¼″) „	4 11
Welded tube 14 to 20 S.W.G. (sizes ½″ to 1½″) „	3/10½ to 5/8½
Brass	
Tubes lb.	1 9⅞
Brazed Tubes „	3 2⅞
Drawn Strip Sections „	3 2⅞
Sheet ton	198 15 0
Strip „	198 15 0
Extruded Bar lb.	2 0⅜
Condenser Plate (Yellow Metal) ton	186 0 0
Condenser Plate (Naval Brass) „	199 0 0
Wire lb.	2 8½

	£ s. d.
Beryllium Copper	
Strip lb.	1 4 11
Rod „	1 1 6
Wire „	1 4 9
Copper	
Tubes lb.	2 3⅜
Sheet ton	264 15 0
Strip „	264 15 0
H.C. Wire „	279 15 0
Cupro Nickel	
Tubes 70/30 lb.	3 8⅛
Lead	
Pipes (London) ton	107 0 0
Sheet (London) „	104 15 0
Tellurium Lead „	£6 extra
Nickel Silver	
Sheet and Strip 10% lb.	3 11½
Wire 10% „	4 4½
Phosphor Bronze	
Wire „	4 2
Titanium (1,000 lb. lots)	
Billet 4½″ to 18″ dia. lb.	47/- 48/-
Rod ½″ to 4″ dia. „	85/- 53/-
Wire ·036″-232″ dia. „	159/- 99/-
Strip ·001″ to ·048″ „	350/- 68/-
Sheet 8′ × 2′. 20 gauge „	73/-
Tube, representative average gauge „	198/-
Extrusions „	90/-
Zinc	
Sheet ton	115 15 0
Strip „	nom.

FOREIGN QUOTATIONS

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

Belgium	fr/kg	£/ton
Copper: electrolytic	31.75	232 1
Tin	126.73	926 8

Canada	c/lb	£/ton
Aluminium	26.00	210 12
Copper: electrolytic	30.00	243 0
Lead	10.50	81 0
Nickel	70.00	567 0
Zinc: Prime western	12.00	97 4
High grade 99.95	12.60	102 1
High grade 99.99	13.00	105 6

France	fr/kg	£/ton
Aluminium	2.43	179 11
Antimony 99·0	2.80	206 18
Cadmium	16.25	1,200 17
Copper: electrolytic	3.22	237 19
Lead	.95	70 4
Nickel	9.00	665 2
Tin	12.92	954 15
Zinc: Thermic	1.16	87 18
Zinc: electrolytic	1.24	91 12
Scrap		
Copper: electrolytic	2.90	214 8
Heavy copper	2.90	214 8
No. 1 copper wire	2.75	203 4
Brass rod ends	2.15	158 17
Zinc castings	.92	67 19
Lead	.87	64 5
Aluminium	1.75	129 6

Italy	lire/kg	£/ton
Aluminium	370	216 1
Antimony 99·0	520	303 13
Copper: wire bars 99.9	450	262 16
Lead	165	97 7
Nickel	1,300	805 14
Tin	1,750	1,022 0
Zinc: electrolytic	181	105 14
Scrap		
Aluminium soft sheet clippings (new)	305	178 2
Lead, soft, first quality	137	80 0
Lead, battery plates	77	45 19
Copper, first grade	380	221 18
Bronze, commercial gunmetal	410	239 8
Brass: heavy	310	181 0
Brass: light	275	160 12
Brass, bar turnings	260	152 16
Old zinc	105	61 6

Switzerland	fr/kg	£/ton
Aluminium	2.50	210 5
Copper: electrolytic	2.88	242 4
Lead	.82	68 19
Nickel	7.50	630 15
Tin	11.25	946 2
Zinc: High grade 99.99	1.06	89 2

Japan	Yen per metric ton
Scrap	
Copper: electrolytic	297,000
Copper wire No. 1	272,000
Copper wire No. 2	268,000
Heavy copper	262,000
Light copper	237,000
Brass, new cuttings	203,000
Red brass scrap	215,000

West Germany *Scrap*	D-marks per 100 kilos	£/ton
Used copper wire	220	200 8
Heavy copper	220	200 8
Light copper	190	173 1
Heavy brass	145	132 1
Light brass	105	95 13
Soft lead	50	45 11
Zinc	50	45 11
Used aluminium unsorted	75	68 6

United States	c/lb	£/ton
Aluminium	26.00	207 4
Antimony 99·0	32.50	259 0
Cadmium	160.00	1,275 4
Copper: electrolytic	31.00	247 10
Lead	11.00	87 13
Nickel	81.25	647 11
Tin	116.87	923 9
Zinc: electrolytic	12.50	99 12

THE STOCK EXCHANGE

Prices Reflect Considerable Apprehension

ISSUED CAPITAL •	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 17 JULY	+ RISE—FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1961 HIGH	1961 LOW	1960 HIGH	1960 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	32/–	—6d.	11	9	6 17 6	33/9	26/3	35/–	26/6
400,000	2/–	Anti-Attrition Metal	1/3		NIL	4	NIL	1/3⅜	0/9	1/6	0/9
43,133,593	Stk. (£1)	Associated Electrical Industries ...	36/9	—1/–	15	15	8 3 3	54/10½	36/6	67/3	38/3
3,895,963	1	Birfield	57/6	—2/–	10	15‡	3 9 6	78/9	45/–	51/3	29/–
4,795,000	1	Birmid Industries	78/–	—3/–	20	20D	5 2 6	103/–	71/3	74/9	56/–
8,445,516	Stk. (10/–)	Birmingham Small Arms	21/–	—3/–	17½QT	12½	5 9 0	36/10½	21/–	30/6	18/3
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	14/–	—6d.	5	5	7 2 9	14/6	13/1½	17/4½	14/9
476,420	Stk. (£1)	Ditto Cum. B. Pref. 6%	16/6	—6d.	6	6	7 5 6	17/6	16/4½	20/–	17/1½
1,500,000	Stk. (£1)	British Aluminium Co. Pref. 6% ...	15/9		6	6	7 12 6	18/–	15/6	21/1½	17/7½
18,846,647	Stk. (£1)	British Insulated Callender's Cables	55/6	—1/6	13½	13½	4 17 3	62/3	49/–	61/4½	47/–
20,456,599	5/–	British Oxygen Co. Ltd., Ord. ...	20/3xd	—2/–	16D	16	2 12 9	28/4½	17/6	35/–	19/10½
1,200,000	Stk. (5/–)	Canning (W.) & Co.	15/–	—9d.	15⅝	25+•2½C‡	5 10 6	20/9	13/7½	19/9	13/7½
60,484	1/–	Carr (Chas.)	1/1½		NIL	12½	—	1/7½	10½d.	2/3	1/–
555,000	1	Clifford (Chas.) Ltd.	31/–		12	10	7 14 9	31/–	26/–	35/–	28/9
45,000	1	Ditto Cum. Pref. 6%	15/–		6	6	8 0 0	15/3	15/–	16/–	15/10½
300,000	2/–	Coley Metals	3/3	+3d.	15	15	9 4 6	4/5½	3/–	5/–	3/4½
10,185,696	1	Cons. Zinc Corp.†	64/–	—3/–	20	15	6 5 0	81/6	64/–	80/9	59/6
5,399,056	1	Davy-Ashmore	140/–	—7/–	27½	22½	3 19 6	177/6	129/6	147/3	99/6
8,000,000	5/–	Delta Metal	20/3	—10½d.	20	17½	4 18 9	27/7½	19/9	28/3	18/6
5,296,550	Stk. (£1)	Enfield Rolling Mills Ltd.	39/6	—1/–	15	15	7 12 0	52/3	39/6	56/9	45/–
1,155,000	1	Evered & Co.	44/–	—3d.	10	10φB	4 11 0	45/9	42/6	42/9	29/3
18,000,000	Stk. (£1)	General Electric Co.	31/3	—1/3	10	10	6 8 0	39/6	29/6	47/9	29/–
1,500,000	Stk. (10/–)	General Refractories Ltd.	58/–	—6d.	25	20	4 6 3	65/–	42/9	52/6	40/–
937,500	5/–	Glacier Metal Co. Ltd.	18/–	—6d.	15	13	4 3 3	21/1½	13/9	16/1½	11/1½
2,500,000	5/–	Glynwed Tubes	23/6	—4/3	22½	25¶	4 15 9	30/3	23/11½	27/6	17/–
7,228,065	10/–	Goodlass Wall & Lead Industries ...	33/–	—9d.	15	19L	4 11 0	44/9	33/–	41/9	33/–
696,780	10/–	Greenwood & Batley	20/6	—2/–	15	30‡	7 6 3	29/6	20/6	33/6	29/1½
792,000	5/–	Harrison (B'ham) Ord.	10/9	—2/–	•10	•20‡	4 13 0	14/6	10/9	15/10½	11/9
150,000	1	Ditto Cum. Pref. 7%	19/9		7	7	7 1 9	20/4½	19/7½	23/6	22/–
1,612,750	5/–	Heenan Group	12/6	—1/–	13	15	5 4 0	17/1½	10/6	13/–	9/10½
251,689,407	Stk. (£1)	Imperial Chemical Industries ...	65/–	—2/6	13½	11½	4 4 9	81/6	63/1½	76/6	54/–
34,736,773	Stk. (£1)	Ditto Cum. Pref. 5%	14/1½		5	5	7 1 6	16/–	13/10½	18/–	15/4½
29,196,118	••	International Nickel	148⅞	—3½	$1.60	$1.50	1 17 0	152½	104	105	84⅜
300,000	1	Johnson, Matthey & Co. Cum. Pref. 5%	14/–		5	5	7 2 9	14/10½	13/6	16/6	14/6
6,000,000	1	Ditto Ord.	70/3	+1/6	15	12	4 5 6	75/–	57/6	67/6	44/9
600,000	10/–	Keith, Blackman	19/–		17½	17½E	9 4 3	21/6	18/3	32/6	17/6
320,000	4/–	London Aluminium	12/6		13	12	4 3 3	15/–	8/6	12/6	7/10½
765,012	1	McKechnie Bros. Ord.	40/–xcap	—2/–	12½K	17½F	6 5 0	53/6	35/4	71/6	57/3
1,530,024	1	Ditto A. Ord.	38/3xcap	—3/–	12½K	17½F	6 10 6	53/3	35/3	69/3	55/–
1,108,268	5/–	Manganese Bronze & Brass	14/6	—6d.	20⅝	20⅝	7 1 0	18/6	14/–	18/6	13/4½
50,628	6/–	Ditto (7½% N.C. Pref.)	5/6		7½	7½	8 3 6	6/–	5/–	6/6	5/9
26,361,444	Stk. (£1)	Metal Box	83/–		12	12M	2 17 9	100/9	68/3	84/3	61/–
415,760	Stk. (2/–)	Metal Traders	7/6	—6d.	50	50	13 6 9	8/7½	6/9	10/9	7/1½
160,000	1	Mint (The) Birmingham	51/6	—2/–	15	12½	5 16 6	53/6	36/–	39/–	33/6
80,000	5	Ditto Pref. 6%	76/3		6	6	7 17 6	77/6	76/–	80/–	75/–
5,187,938	Stk. (£1)	Morgan Crucible A	57/3		14	13	4 17 9	71/3	53/4½	63/–	47/6
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	15/–	—6d.	5½	5½	7 6 9	17/–	14/9	18/9	15/9
3,850,000	Stk. (£1)	Murex	42/9	—2/9	22½J	15	6 0 3	52/–	39/9	45/–	35/3
585,000	5/–	Ratcliffs (Grear Bridge) Ord. ...	16/3		10	10R	3 1 6	16/6	15/9	17/–	14/9
195,000	5/–	Ditto 8% Max. Ord.	5/–		8	—	8 0 0	5/1½	4/9	5/3	5/–
1,064,880	10/–	Sanderson Kayser	30/–	—1/–	17½	35‡	5 10 0	41/3	30/–	40/3	27/7½
3,400,500	Stk. (5/–)	Serck	14/9	—1/3	12½	17½GD	4 4 9	19/3	14/9	25/6	15/3
8,035,372	Stk. (£1)	Stone-Platt Industries	50/–	—4/–	16	15	6 8 0	67/–	50/–	64/4½	52/3
2,928,963	Stk. (£1)	Ditto 5½% Cum. Pref.	15/–		5½	5½	7 6 9	18/–	14/–	18/7½	15/3
35,344,881	Stk. (£1)	Tube Investments Ord	67/3	—3/3	14	20	4 3 3	85/6	67/–	140/3	63/10½
41,000,000	Stk. (£1)	Vickers	30/–	—1/–	10	10	6 13 3	38/3	28/–	39/7½	27/1½
750,000	Stk. (£1)	Ditto Pref 5%	14/–		5	5	7 2 9	15/–	12,7½	17/6	13/3
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	18/9	—6d.	•5	•5	7 18 9A	21/1½	18/3	24/6	20/1½
4,594,418	1	Ward (Thos. W.) Ord.	69/–	—5/9	13⅜	25	3 19 9	84/6	64/6	94/–	63/–
7,109,424	Stk. (£1)	Westinghouse Brake	35/9	—1/6	11	10	6 3 0	46/3	35/9	60/6	37/6
323,773	2/–	Wolverhampton Die-Casting ...	8/6		35	30	8 4 9	13/4½	8/6	13/10½	8/1½
591,000	5/–	Wolverhampton Metal	22/6xd	—6d.	32½	32½	7 4 6	30/–	22/6	39/9	23/9
156,930	2/6	Wright, Bindley & Gell	4/6	—1½d.	15	20‡	8 6 9	4/9	3/7½	4/6	2/10½
124,140	1	Ditto Cum. Pref. 6%	13/–		6	6	9 4 6	13/7½	13/–	15/–	13/6
150,000	1/–	Zinc Alloy Rust Proof	4/9xd		4D	30	8 8 6	5/6	4/6	5/4½	4/–

•Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting. ••Shares of no Par Value. ‡and 100% capitalized issue. • The figures given relate to the issue quoted in the third column. A Calculated on £7 8 9 gross. D and 50% capitalized issue. C paid out of Capital Profits. E and 50% capitalized issue in 7% 2nd Pref. Shares. R and 33⅓% capitalized issue in 8% Maximum Ordinary 5/– Stock Units. φ and 6½% from Capital Profits. B and 50% capitalized issue. G and 1½d. special distribution. F and special 5% tax free dividend and 50% Capitalized issue. H As forecast. ¶And 3 for 7 capitalized issue. L and 33⅓% capitalized issue. M and 10% capitalized issue. J and 75% capitalized issue. S and 40% capitalized issue. O calculated at 13⅔%. Interim on smaller capital. P calculated at 11⅓% Q also 1/– special tax free dividend and 50% capitalized issue. T Per £1 unit. Z After capital reorganization. The Thomas Bolton Capital has been acquired by British Insulated Callender's Cables. K. Forecast dividend.

A phone call...

to our representative, when next you have alloy scrap for disposal, for prompt and efficient service on

Nimonic 75, 80, 90, 95, Inconel and Nickel Chrome Heat Resisting Steels. Stainless Steels. Scrap, Turnings, Reusable Materials.

SHEFFIELD
Sheffield 77423
for
Mr. G. S. Baigent.

MANCHESTER
Failsworth 3176
for
Mr. N. Lusby.

BIRMINGHAM
Calthorpe 2515
for
Mr. O. B. Nyquist.
(pronounced kneekwist)

Ring
Failsworth 3176
& bring to your service
Mr. N. Lusby

T. W. JOHNSON & CO. LTD.
40 WORTHING RD., SHEFFIELD 9
1 WOODFORD ROAD FAILSWORTH, MANCHESTER
83 GEORGE ST., BALSALL HEATH, BIRMINGHAM

BOLTON'S

H.C. COPPER

STRIP, SHEET, TAPE & FOIL

Plain and tinned; drawn, rolled, rolled and drawn, or rolled and sheared. Sheets up to 10 ft. × 5 ft. in suitable thicknesses $\frac{1}{16}$" and upwards; thinner sheets 6 ft. × 3 ft. or 4 ft. × 2 ft.

Annealed strip for generator and transformer windings, etc., with square or rounded corners, or with rounded edges; Bolton's specialize in the production, in suitable sizes, of long jointless lengths weighing up to 18 cwt. Hard-drawn and semi-hard-drawn strip in coils or in straight lengths; supplied in special tempers, to close tolerances, and on drums, when required. Foil down to 0·001" thick by 3" wide. Annealed strip to special tolerances for co-axial cables.

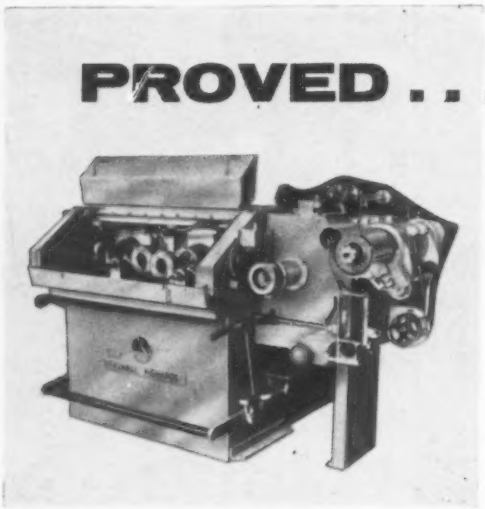
THOMAS BOLTON & SONS LTD

Head Office : Mersey Copper Works, Widnes, Lancashire.
Tel.: Widnes 2022.

London Office & Export Sales Department ;
168 Regent Street, W.1.
Tel.: REGent 6427.

THOMAS BOLTON & SONS LTD

PROVED . . . now IMPROVED



This 16 F.L. fine drawing machine for copper is our latest version of a type which has been for many years in quiet, trouble-free production of wire between .0084″ and .002″ in wire mills the world over.

Improvements now incorporated include:

DRAWING SPEED Now up to 6,000 feet per minute.

AUTOMATIC STOP On full spool and wire breakage.

SPOOLER For 20lb. C.M.A. spools:

- accelerates exactly in step with the machine
- gives constant controlled wire tension* through the whole of the spooling operation
- stops exactly in step with the machine.

PRICE No change (we consider this to be a *great* improvement nowadays).

**This allows the wire to be annealed on the spool (which is in our opinion, the best place to do it) with none of the troubles sometimes experienced because of inefficient spooling.*

MARSHALL RICHARDS
MACHINE COMPANY LIMITED

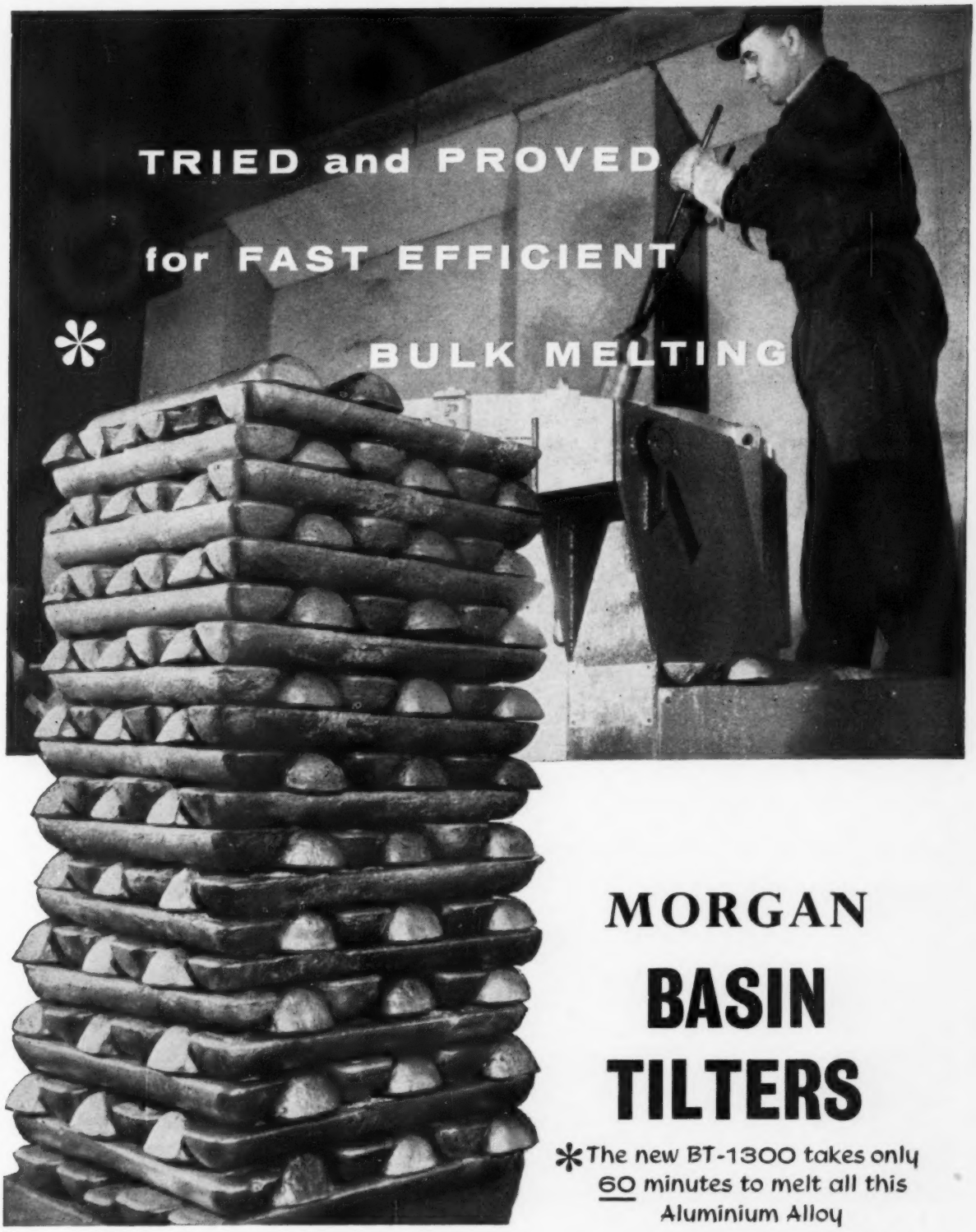
WIRE DRAWING MACHINERY
TUBE DRAWING MACHINERY
ROLLING MILLS
SWAGING MACHINES
TURKS HEADS Section Rolling Machines

TELEPHONE CROOK 272
TELEGRAMS MARICH, CROOK

CROOK · COUNTY DURHAM · ENGLAND

Marshall Richards also manufacture under licence the complete range of products of The Fenn Manufacturing Company, Hartford, Connecticut, U.S.A.

MR 145



MORGAN
BASIN TILTERS

*The new BT-1300 takes only 60 minutes to melt all this Aluminium Alloy

During the past eighteen months 54 Morgan Basin Tilters have been installed in modern foundries for fast and economical bulk melting of a wide range of high quality aluminium or copper based alloys.

For top quality castings and lowest melting loss, invest in the most flexible of all bulk melters. Ask for a demonstration, with your own metal if preferred, at the Battersea Test Foundry.

MORGANITE CRUCIBLE LIMITED, NORTON WORKS, WOODBURY LANE, WORCESTER. Telephone: Worcester 26691 Telex: 33191

A Member of The Morgan Crucible Group.

F54A

Quality ingots

Speedy and efficient handling gives you a really first class delivery on all types of metal ingots. Years of experience in the manufacture of ingots, plus the knowledge of our customers particular requirements, enables us to meet any individual demand.

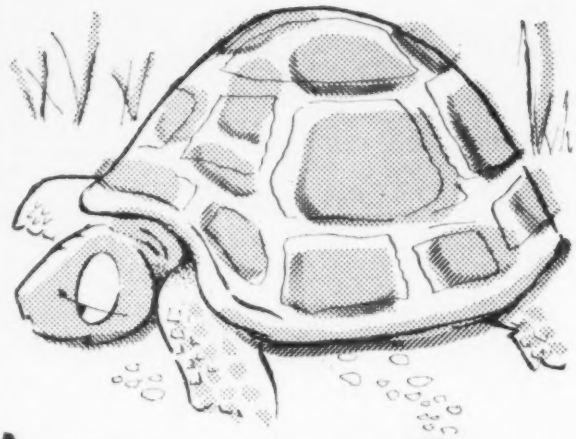
HENEAGE INGOTS

IN BRASS GUN METAL & PHOSPHOR-BRONZE

HENEAGE METALS LTD.

HENEAGE STREET, BIRMINGHAM 7

Telephone: ASTon Cross 1177/8



More than Skin-Deep

Cruickshank-Pennsalt and Cruickshank-Iridite processes give that added protection in depth to your products.

The extensive range of these time proven processes gives you the process to suit *your* product—with economy and reliability of operation.

Why not write asking for our representative to call and discuss how Cruickshanks can help in your finishing line.

CRUICKSHANK pennsalt

processes for

- Phosphating
- Cleaning
- De-rusting
- Aluminium pre-cleaning

CRUICKSHANK *iridite*

Chromate conversion processes for

- Aluminium
- Cadmium
- Copper and Brass
- Magnesium
- Silver
- Zinc

Processes you can rely on, supported by qualified chemist and technical service engineers.

CRUICKSHANK'S

R. CRUICKSHANK, LTD.

CAMDEN ST., BIRMINGHAM 1

Telephone: CENtral 8553 (6 lines)

Telegrams: Cruickshank, Birmingham

"Pennsalt" is a Trade Mark of the Pennsalt Chemicals Corporation, Philadelphia, Pennsylvania, U.S.A., licensed to R. Cruickshank, Ltd., for use in the U.K.

"Iridite" is a Trade Mark of the Allied Research Corporation Inc. Baltimore 3 Maryland, U.S.A., licensed to R. Cruickshank, Ltd., for use in the U.K.

SM/C5046

Alexander 3-D pantographic diesinking machines

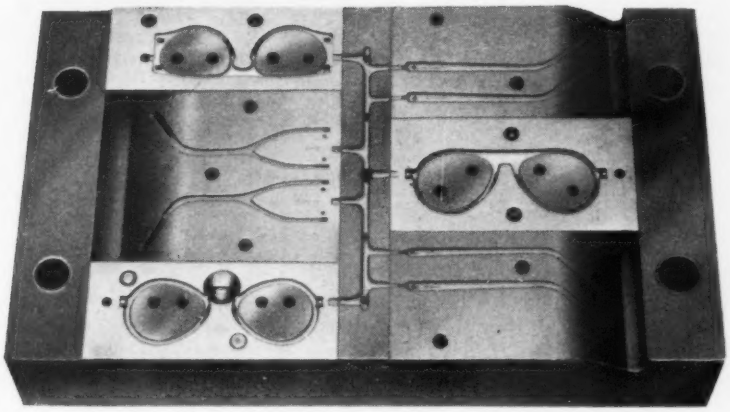


Illustration shows a typical mould produced on the ALEXANDER DIESINKING Machines where accuracy and fine detail are of paramount importance. To facilitate optimum results we make a range of Optical Accessories for checking the form of cutters and setting the pantograph for perfect reproduction.

Pantograph ratios 1.5:1—10:1
Stylo and Cutter positions can be reversed to produce enlarged Master from original component.
Full range of accessories available for flat, curved or circular workpieces, also various types of Cutter Grinders.

ENGRAVERS!

For applications not requiring a three-dimensional pantograph, we manufacture a range of two-dimensional Engraving Machines fitted with 1:1—50:1 pantograph ratios. Fixed ratio and large area pantographs and special purpose machines manufactured to suit customers' requirements.

GEORGE H. ALEXANDER MACHINERY LTD

82–84 COLESHILL STREET
BIRMINGHAM 4, ENGLAND
Tel: ASTon Cross 3264 (7 lines)
Grams: "Viking, Birmingham"

NON-FERROUS

GUNMETAL · BRASS · PHOSPHOR BRONZE · LEAD BRONZE · ALUMINIUM BRONZE · MANGANESE BRONZE · SILICON BRONZE · NICKEL SILVER · BRAZING METAL · ALUMINIUM
A.I.D. & ADMIRALTY APPROVED
Also SELECTED SCRAP METALS

THE CITY CASTING & METAL CO., LTD.
BARFORD ST., BIRMINGHAM, 5
Telegraphic Address: "Turnings" Birmingham
Telephone: Midland 0645

INGOTS
SINCE 1888

SPECIALISTS

IN ALL GRADES OF NEW and OLD
NON-FERROUS SCRAP METALS and RESIDUES

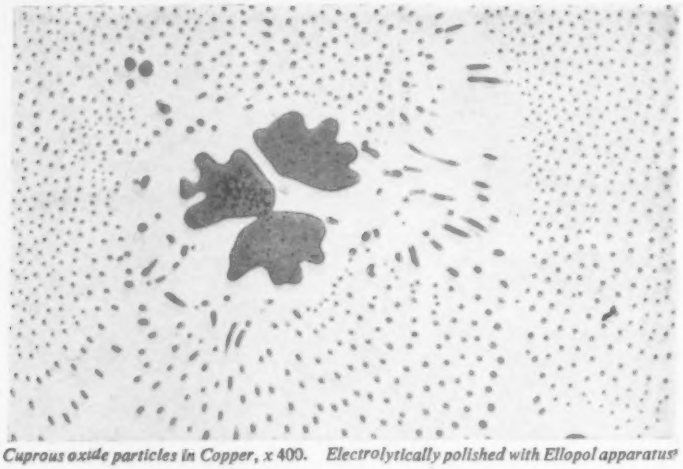
Members of The National Association of Non-Ferrous Scrap Metal Merchants.

IMPORT
EXPORT

Arthur E. **Milner** (METALS) LTD

DUNTON WORKS, KINGSBURY ROAD, CURDWORTH, SUTTON COLDFIELD, WARWICKS.
Tel.: Curdworth 352/353. Grams: Telex 33-147
London Offices: City Wall House, 129/139, Finsbury Pavement, E.C.2.
Tel.: Monarch 5622. Cables: Milnamet, London.

METALLOGRAPHY



Cuprous oxide particles in Copper, x 400. Electrolytically polished with Ellopol apparatus

ANNOTATED METALLOGRAPHIC SPECIMENS
(*Wide range of micro specimens with full descriptive notes*)

THE ELLOPOL ELECTROLYTIC POLISHER
(*P. A. Jacquet Method*)

NACHET MICROSCOPES

SPECIMEN PREPARATION AND POLISHING EQUIPMENT
DIAPLASTOL DIAMOND COMPOUND
DURMAX AND LINDE ALUMINA
METRON POLISHING CLOTHS

END QUENCH UNIT
HARDNESS TESTING MACHINES

Write for details to

METALLURGICAL SERVICES
Proprietors: Planned Products (Metallurgy) Ltd.
1 RELIANT WORKS
BETCHWORTH – SURREY – ENGLAND
BETCHWORTH 2364

BY METALLURGICAL SERVICES

RE-MELTED ZINC XXX BRAND

FOR ALLOYING →

PRODUCED UNDER LABORATORY CONTROL
QUALITY GUARANTEED

FOR GALVANISING →

DEUTSCH & BRENNER
LIMITED
HARFORD STREET, BIRMINGHAM, 19. Also at Cardiff & Manchester
Telephone: Northern 3838 (11 lines) Telex 33-374 · Cardiff 31833 · Blackfriars 9630

H. BARNETT LTD.
VICTOR ROAD, LONDON, N.7
(ESTAB. 1865.)

SPECIALIZE IN
NON-FERROUS SCRAP METALS

Selected Brass, Copper, Gunmetal and Aluminium Scrap, carefully prepared for foundries.

TEL: ARCHWAY 5461 (5 LINES)

ENTORES LIMITED

ORES, METALS *and* RESIDUES

City Wall House, 14-24 Finsbury Street, LONDON, E.C.2.
'Phone: MONarch 6050
Cables: ENTORES, LONDON
Telex No. LONDON 28455

Classified Advertisements

Rate: Advertisements set in run-on style **5d.** per word, minimum **5/-**. Semi-displayed announcements are charged at **27/6** per inch depth. Box Numbers: add 5 words, plus **1/-** for registration and forwarding replies. "Copy" accepted at London Office up to 1st post on each Friday for the following Friday's issue.

Series Discounts: Details upon application to "Metal Industry," Dorset House, Stamford Street, London, S.E.1. Remittances payable to "Metal Industry". The proprietors retain the right to refuse or withdraw "copy" at their discretion and accept no responsibility for matters arising from clerical or printers' errors.

AGENCIES WANTED

PROGRESSIVE company, having recently doubled floor space, is interested in agency or distributorship for Midlands area. Modern storage accommodation, lorries and forklift capacity available. Anything considered. Particulars to: Messrs. Peter Billson & Co. Limited, Triplet Works, Pixhelve Street, West Bromwich. Telephone Tip.on 2453/4. [8399

APPOINTMENTS VACANT

METALLURGIST (Honours degree) required by Royal Mint, to assist in supervision of production, investigation of problems of materials and manufacture, assaying and general research in the fields of physical metallurgy and metallography.

THE post is graded Scientific Officer and carries a starting salary of £793 with additional credit for Forces service and experience, and rises to a maximum of £1,282. Good promotion prospects. Apply in writing for particulars to Establishment Officer, Royal Mint, London, E.C.3, giving details of age and experience. [8401

PATENT Examiners and Patent Officers. Pensionable posts for men or women for work on the examination of Patent applications. Age at least 20 and under 29 (36 for Examiners), on 31.12.61, with extension for regular Forces service and Overseas Civil Service. Qualifications: normally a degree, or a Diploma in Technology, with first or second class honours in physics, chemistry, engineering or mathematics, or equivalent attainment, or professional qualification, e.g. A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.R.I.C., A.Inst.P. Inner London salary £793 to £1,719; provision for starting pay above minimum. Promotion prospects. Write Civil Service Commission, 17 North Audley Street, London, W.1, for application form, quoting S/128/61, and stating date of birth. [8404

YOUNG man required to supervise small foundry laboratory. Work involves routine analysing and quality control of non-ferrous castings. This post provides a good opportunity of studying the practical operation of the foundry and assisting the foundry manager in production control. Progressive position with good wages for suitably qualified applicant. Works located near the City of Birmingham Football Ground. Box 4365, c/o Metal Industry. [8393

BUSINESS OPPORTUNITIES

PRIVATE limited company connected with scrap metal industry and possessing property in Middlesex, with development permission for foundry facilities, wishes to acquire or participate in an established foundry business specializing in non-ferrous alloy manufactures or ferrous castings. Write full details to Box 4367, c/o Metal Industry. [8395

CAPACITY AVAILABLE

SURFACE Finishing of Contoured Parts. Internal and External, up to 12" dia. and 18" long. Elliptical, Square, Rectangular, Hexagonal, Octagonal, etc.

ARMYTAGE BROS. (KNOTTINGLEY) Ltd., Foundry Lane, Knottingley, Yorkshire. Telephone Knottingley 2743-4. [0001

KELLERING and Cam Profiling Capacity up to 8 ft×6 ft., or 6 ft. diameter.

ARMYTAGE BROS. (KNOTTINGLEY) Ltd., The Foundry, Knottingley, Yorkshire. Tel. Knottingley 2743-4. [8364

SHEET Metal Fabrications of precision and repetitive nature a speciality. Wades (Halifax) Ltd., Arden Works, Fenton Road, Halifax. [0020

HEAT TREATMENTS

A.R.B.—D.G.I. APPROVED.

ELECTRO HEAT TREATMENTS LTD.

BULL LANE, WEST BROMWICH, STAFFS. Telephone No.: Wes. 0584-0756.

BRIGHT Annealing. Bright Hardening. Case Hardening. Carbo Nitriding; Gas Carburizing; High Frequency.

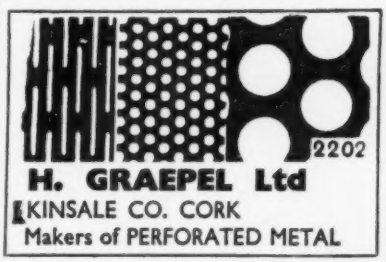
LIGHT Alloys: Solution; Precipitation, up to 10 ft.

CONTROLLED atmospheres for all treatments, including hardening, annealing and tempering of ferrous and non-ferrous alloys.

LABORATORY SUPERVISION.
LOCAL DELIVERIES. [0005

ZINC BASE ALLOYS
99·99+% PURITY ZINC
BROCK
METAL COMPANY LIMITED
BADGER WORKS, SALTLEY RD., BIRMINGHAM, 7.
TEL: ASTON CROSS 1351-2
PHONE FOR PROMPT DELIVERY!

REGULAR BUYERS OF
NICKEL AND NICKEL ALLOYS
STAINLESS STEEL SCRAP AND TURNINGS
NICKEL STEEL BATTERIES
CAR RADIATORS
MITCHAM SMELTERS LTD.
Redhouse Road, CROYDON, Surrey
Telephone: THOrnton 6101 P.B.X.



MATERIALS FOR SALE

ENGINEERING Co. has surplus for disposal: Phos. Bronze Bars and Tubes, Specn. 2.B.8 in sizes ranging ⅛" to 2⅛" dia. 1½" o.d.×1⅛" i.d. to 3⅛" o.d. × 2⅛" i.d., and Bt. Steel Bars Specn. EN.2 0·093" to ⅛" dia. and 0·437" to 0·866 A/F. Material in first class condition as purchased. Further details on request. Offers invited for lot or part lots. Box 4371, c/o Metal Industry. [8402

PATENTS

THE proprietor of British Patent No. 728634, entitled "Inhibition of Corrosion of Metals", offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern & Carlberg, 140 South Dearborn Street, Chicago 3, Illinois, U.S.A. [8396

PLANT FOR SALE

FOR Disposal — Monometer 1,800-2,000 lb. aluminium capacity fully mechanized oil-fired Rotary Melting Furnace. Cylindrical body rotating in two machined tyres arranged with one open end for charging and exhaust. Suitable cowling and stack. Firing by K.B.; 24" motor driven fan and swinging pillar type No. 2. Wallsend Burner for 200 sec. oil. All electric for 440 volt, 3-phase, 50 cycles supply. Price £1,350.

FOR further information and appointment to inspect, contact Mr. A. J. Baldwin, Light Production Ltd., Liverpool Road, Slough (Phone Slough 24147-8-9). [8406

PLANT FOR SALE

PAIR of 21" × 39" Two-High Hot and Cold Rolling Mills by Taylor & Farley, with reduction gear fitted flywheels and 300 h.p. drive.

30"×36" Two-High Reversing Mill by Davy United; motorized screw-down with 500 h.p. motor drive.

12"×22" Two-High Rolling Mill with 75 h.p. drive.

9"×21" Two-High Aluminium Foil Mill with 75 h.p. variable speed drive, let-off and coiler.

350 TON Hydraulic Stretcher with de-twisting gear.

100 TON Bigwood Stretcher for sections up to 26' long.

SCALPING Machine for billets 40" square.

REED BROTHERS (ENGINEERING) LTD.

(Receiver and Manager—Mr. C. E. M. Hardie)
WOOLWICH INDUSTRIAL ESTATE,
LONDON, S.E.18.
Tel.: Woolwich 7611. [8403

COVENTRY Climax and Conveyancer Forklift Trucks. A choice selection of Electric, Petrol and Diesel models. From 1,500 lb. to 5,000 lb. capacity; 9 ft. to 12 ft. lifts. Full details. Photographs and prices from Speed Electrics, Dept. MI., Church Street, Basford, Nottingham. Tel. 75716. [8405

FOR Hire and Sale, Forklift Trucks of every description, including Electric Reach trucks, side lift, all tonnage, powered by diesel, electric, L.P. gas and petrol. B. G. Plant (Sales Agency) Ltd., Watlington 44, Oxon. [8400

KEK Grinding Mill, No. 3 size; 13" discs; with bag attachments. First-class condition; £250. International Refining Co. Ltd., Sugar House Lane, Stratford, E.15. [8392

SCRAP METAL (SALE & WANTED)

B. J. PERRY & CO. LTD.

Exchange Buildings, Birmingham, 2
for Phosphor Bronze Swarf and Scrap
and all Non-Ferrous Metals.
Tel.: Midland 5986-7. [0113

NICKEL and High Nickel Content Scrap wanted. "Nimonics", "Inconel" "Monel", etc. Offer for best prices to Nicholson & Rhodes Ltd., Princess St., Sheffield, 4. Phone 27491. [0011

TIME RECORDERS

FACTORY Time Recorders. Rental Service. Phone Hop. 2239. Time Recorder Supply and Maintenance Co. Ltd., 157-159 Borough High Street, S.E.1. [0014

BOOKS

RESISTANCE Welding in Mass Production. By A. J. Hipperson, B.Sc.(Eng.), A.M.Inst.W., and T. Watson, M.Inst.W. The ground covered by this book ranges from the first principles of each process to its scientific application in mass production. Particular reference is made to design and production requirements. 21s. net from all booksellers. By post 22s. 1d. from Iliffe Books Ltd., Dorset House, Stamford Street, London, S.E.1.

AUTOMOBILE Efficiency: Maintaining Performance with Electrical Test Equipment. By E. T. Lawson Helme, A.M.A.E.T., A.M.I.M.I. A valuable handbook describing how to establish an efficient engine tuning, testing and maintenance service. Covers every aspect, including modern service station requirements, tracing lost performance, automobile electrical equipment, electrical workshop practice, organizing a battery charging service, commercial development of a tuning service and creating a public demand. 10s. 6d. net from all booksellers. By post 11s. 3d. from Iliffe Books Ltd., Dorset House, Stamford Street, London, S.E.1.

PRODUCTION Engineering: Practical Methods of Production Planning and Control. By J. S. Murphy, A.I.I.A. This practical book deals with factory organization, each separate item or function being discussed in the order in which it arises in practice. The book provides experienced production engineers with an opportunity to compare different methods. 12s. 6d. net from all booksellers. By post 13s. 5d. from Iliffe Books Ltd., Dorset House, Stamford Street, London, S.E.1.

INDEX TO ADVERTISEMENTS

	Page
Alexander Machinery Ltd., George H.	21
Alexander Metal Co. Ltd.	12
Aluminium Bronze Co. Ltd.	18
Associated Pressings Ltd.	24
Barnett Ltd., H.	22
Bolton & Sons Ltd., Thomas	17
British Aluminium Co. Ltd., The	2
Brock Metal Co. Ltd., The	23
Canning & Co. Ltd., W.	*Inside front cover*
Carrs Paints Ltd	3
City Casting & Metal Co. Ltd.	21
Cohen & Co. Ltd., A.	*Outside back cover*
Consolidated Zinc Corporation (Sales) Ltd.	16
Cruickshank Ltd., R.	20
Deutsch & Brenner Ltd.	22
Entores Ltd.	22
Firma-Chrome Plating Co. Ltd., The	12
Frost Ltd., N. T.	*Inside front cover*, 24
Geigy Co. Ltd., The	14
Graepel Ltd., H.	23
Grauer & Weil Ltd.	*Inside back cover*
Harris Plating Works Ltd.	12
Heneage Metals Ltd.	20
Ilfar Aluminium Co. Ltd.	12
Imperial Chemical Industries Ltd.	*Outside front cover*, 7
International Refining Co. Ltd.	*Inside back cover*
Johnson & Co. Ltd., T. W.	17
Jones & Rooke (1948) Ltd.	*Inside back cover*
Manganese Bronze & Brass Co. Ltd.	5
Marshall Richards Machine Co. Ltd.	18
Metal Castings Ltd.	8
Metallurgical Services Ltd.	22
Milner Metals Ltd., A. E.	21
Mitcham Smelters Ltd.	23
Morgan Crucible Co. Ltd.	19
Nickel Anodes & Non-Ferreous Castings Ltd.	4
Powder Metallurgy Ltd.	24
Robertson & Co. Ltd., W. H. A.	6
Sklenar Furnaces Ltd.	10
Stein & Atkinson Ltd.	9
Stuart (London) Ltd., Robert	12
Thermal Syndicate Ltd.	11
Vacuum Industrial Applications Ltd.	13
Wolverhampton Metal Co. Ltd.	1

N.T. FROST LTD

HARFORD ST., B'HAM 19

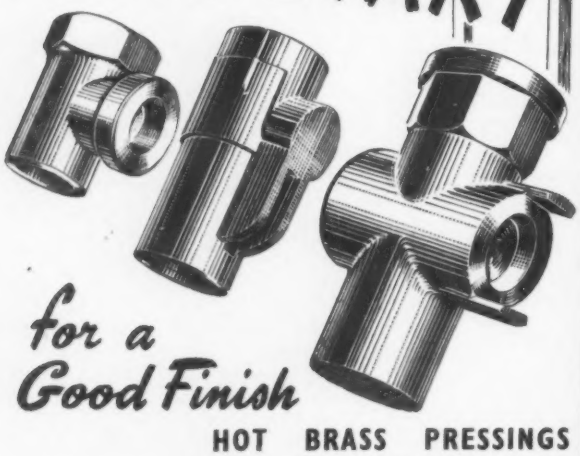
ELECTROPLATERS

The Specialist Electroplaters of Small Work in Quantities

FULLY APPROVED R.I.D. ALL FINISHES

TEL: CEN 4135 (6 LINES)

A FINE START



for a Good Finish

HOT BRASS PRESSINGS for GAS, WATER and ELECTRICAL FITTINGS and GENERAL ENGINEERING TRADES

by

ASSOCIATED PRESSINGS LIMITED

SPRINGCROFT ROAD, BIRMINGHAM 11

METAL POWDERS by

POWDER METALLURGY LTD

Trading as F. W. BERK & CO., LTD

POWDER METALLURGY DIVISION

BERK HOUSE, P.O. BOX 500, PORTMAN SQUARE, LONDON, W.1.

Telephone HUNter 6688

Printed in Great Britain by James Cond Ltd., Charlotte St., Birmingham 3. Published by Iliffe Production Publications Ltd., Dorset House, Stamford St., London, S.E.1

OVER 100 YEARS EXPERIENCE

NICKEL SILVER

SHEET STRIP WIRE SECTIONS

CUPRO-NICKEL

STRIP WIRE

SPECIALISATION ENSURES CLOSE CONTROL OF QUALITY

We Specialise

Enquiries to:-

Jones & Rooke (1948) Ltd.

86-92, NORTHWOOD STREET, BIRMINGHAM 3

Telephone: CEN 4886/7/8 3 lines

Consult

INTERNATIONAL REFINING CO., LTD.

for prices prior to disposal of your Non-Ferrous Metal Scrap and Residues, whether clean or irony.

Consult

Maryland Alloys Ltd.

for your requirements of Non-Ferrous Metal Ingots, whether of commercial or complex specifications.

Consult

Non-Ferrous Stockholders Ltd.

for your requirements of Sheets, Strips, Rods, Bars, Sections, in Aluminium and Alloys, Brass, etc., whether for immediate or long-term requirements.

Consult

Alloy & Metal Stockholders Ltd.

for your requirements in Steel Sheets, Rods, R.S.J.'s, Plates, etc., whether from our extensive stock or for future requirements.

HEAD OFFICE and WORKS
20/22 SUGAR HOUSE LANE, LONDON, E.15
Tel: MARyland 7771 (5 lines) LONDON TELEX No. 2-3314

BIRMINGHAM
LANCASTER COPPER WORKS, 87-95 LANCASTER ST., B'HAM, 4
Tel: ASTon Cross 1982 P.B.X.

MANCHESTER
26, LYNTHORPE ROAD, NEW MOSTON, MANCHESTER 10

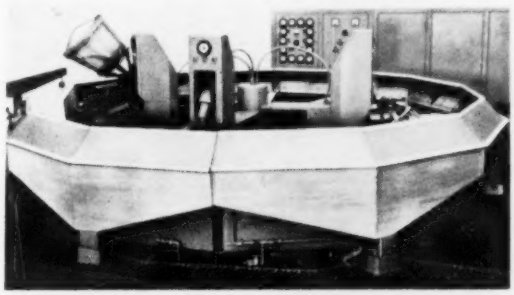
NEW——

BARREL PLATING

WITH A DIFFERENCE

The Rovac "Carousel" system offers a cost cutting and quality improving answer to the problem of barrel finishing small parts. Fully automatic units of up to 14 tanks and 9 Barrel or Basket carrying heads are available. Each head can have a different process cycle, and can be re-programmed at will.

The "Toupie" single head units with one or more tanks are also available, the barrels being manually or pneumatically raised or lowered and being manually transferred from process tank to process tank. The barrels are designed for automatic loading and unloading of work.



GRAUER & WEIL LTD

SHEERWATER · WOKING · SURREY · ENGLAND

Phone: Woking 5681 (3 lines) *Grams: Pernix, Woking*

also PARIS · BRUSSELS · GENEVA · MILAN · CASTRO URDIALES · BOMBAY

AS GOOD

AS GOLD!

(Enlarged three times)

The golden sovereign! Almost a museum piece in Britain. Yet because of its prestige abroad, millions of newly-minted sovereigns have been shipped overseas in recent years each with its reputation of being —"as good as gold". Our World Famed Ingots have earned a similar prestige and reputation throughout the globe for their purity and quality backed up by 161 years of integrity, skill and experience.

A. COHEN & CO. LTD.

8, WATERLOO PLACE, LONDON, S.W.1

Telephone: WHITEHALL 6753 Telex No.: 23111 Cables: Cohen, London, Telex